LIBRARY OF

Dr. Z. P. Metcalf

1885–1956

A. A. Rogers

ORANG-UTAN AND CHIMPANZEES IN THE BERLIN AQUARIUM.
(From an Original Drawing.)

CASSELL & COMPANY LIMITED, LUDGATE HILL, LONDON

BIRDS.

1. Gould's Humming Bird (*Ornismya gouldii*).
2. Kingfisher (*Alcedo ispida*).
3. Arctic Tern (*Sterna hirundo*).
4. White-bellied Swift (*Cypselus melba*).
5. Smew (*Mergus albellus*).
6. Penguin (*Pygoscelis tanuata*).
7. The Amazon Parrot (*Chrysotis*).
8. Heron (*Ardea cinerea*).
9. Eared Owl (*Asio otus*).
10. White-tailed Eagle (*Haliaëtus albicilla*).
11. Black-headed Gros-beak (*Coccothraustes erythromelas*).
12. Impeyan Pheasant (*Lophophorus sclateri*).
13. Common Rhea (*Rhea americana*).
14. Crown Pigeon (*Goura coronata*).

CASSELL'S

NATURAL HISTORY

EDITED BY

P. MARTIN DUNCAN, M.B. (LOND.), F.R.S., F.G.S.

PROFESSOR OF GEOLOGY IN AND HONORARY FELLOW OF KING'S COLLEGE, LONDON;
CORRESPONDENT OF THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA

VOL. I.

ILLUSTRATED

CASSELL AND COMPANY, LIMITED

LONDON, PARIS & MELBOURNE

1896

ALL RIGHTS RESERVED

APES AND MONKEYS.

PROFESSOR P. MARTIN DUNCAN, M.B. (Lond.), F.R.S. F.G.S., &c.

LEMURS.

J. MURIE, M.D., LL.D., F.L.S., F.G.S., &c.,

AND

PROFESSOR P. MARTIN DUNCAN.

CHIROPTERA.

W. S. DALLAS, F.L.S.

INSECTIVORA.

W. S. DALLAS, F.L.S.

CONTENTS.

PAGE

INTRODUCTION xiii

CLASS MAMMALIA.

ORDER I.—QUADRUMANA.—THE APES AND MONKEYS.

CHAPTER I.

INTRODUCTION—THE MAN-SHAPED APES—THE GORILLA.

The World of Monkeys, and its Division into great Groups—Distinction between the Old World and New World Monkeys—Classification of Monkeys—THE GORILLA, Ancient and Modern Stories about it—Investigations of Savage and Du Chaillu—General Description—The Head, Brain, Teeth, Taste, Smell, and Voice—The Air Sacs, and Ear—The Limbs and Muscles—Method of Climbing—Diet—Hunting the Gorilla—Attempts to Capture Alive—A Tame Gorilla 1

CHAPTER II.

THE MAN-SHAPED APES (*continued*)—THE NSCHIEGO MBOUVÉ—THE KOOLO-KAMBA—THE SOKO—THE CHIMPANZEE.

THE NSCHIEGO MBOUVÉ—Its Nests and Habits—A Specimen Shot—Differences between it and the Gorilla—Structural Peculiarities—THE KOOLO-KAMBA—Meaniog of the Name—Discovered by Du Chaillu—Its Outward Appearance and Anatomy—THE SOKO—Discovered by Livingstone—Hunting the Soko—THE CHIMPANZEE—In Captivity—On board Ship—A Young Chimpanzee—The Brain and Nerves—Anatomical Peculiarities—General Remarks upon the Group 39

CHAPTER III.

THE MAN-SHAPED APES (*continued*)—GENUS *Simia*—THE ORANG-UTAN.

Origin of the Name—Description of the Orang—Rajah Brooke's First Specimen—Mr. Wallace's Experiences in Mias Hunting—The Home of the Mias—A Mias at Bay—Their Nests, Habits, Food, and Localities—Different kinds of Orangs—Structural Points—The Intelligence and Habits of the Young—The Brain and its Case—Resemblances and Differences of Old and Young 59

CHAPTER IV.

THE MAN-SHAPED APES (*concluded*)—THE GIBBONS—THE SIAMANGS—THE TRUE GIBBONS.

General Characteristics of the Species—THE SIAMANG—Its Habits and Anatomy—Distinctness from the Orangs and Gibbons—Special Peculiarities—THE WHITE-HANDED GIBBON—Where Found—Its Cry—Its Habits—Special Anatomical Features—THE HOOLOOK—Where Found—A Young One in Captivity—Shape of the Skull—THE WOOYEN APE—Its Appearance and Habits—THE WOW-WOW—Very little known about it—THE AGILE GIBBON—Reason of the Name—Peculiarities of the Anatomy—General Comparison of the Different Varieties of the Great Apes 73

CHAPTER V.

THE DOG-SHAPED MONKEYS—SEMNOPITHECUS—COLOBUS.

General Characteristics of the Monkeys of the Old World—Distinguished from the Apes by Length of the Hinder Limbs and presence of Tails—Divided into those with and those without Cheek-pouches—Use of the Cheek-pouches—The two Genera of Pouchless Monkeys—THE SACRED MONKEYS, or Semnopitheci—Derivation of the Name—

PAGE

First Discovery—Ape Worship in India—General Description—Limited to Asia—THE SIMPAI—Its Locality and Appearance—THE BUDENG—Hunted for their Fur—Its Colour and Appearance—THE LONG-NOSED MONKEY—Reason of the Name—Quaint Appearance of the Young—Anatomical Peculiarities—Their First Appearance in Europe—Description of the Nose—Peculiar Formation of the Stomach—Bezoars—THE HOONUMAN MONKEY—The Sacred Monkey of the Hindoos—Legends about it—THE DOUC MONKEY—Its Appearance and Habitat—THE BLACK-LEGGED DOUC—Anatomical Peculiarities—THE CROWNED MONKEY—THE RED MONKEY—THE SUMATRA MONKEY—THE WHITE-BEARDED MONKEY—Found in Ceylon—Its Intelligence—THE GREAT WANDEROO—Other Ceylonese Monkeys—THE GENUS COLOBUS, or Thumbless Monkeys—Description of the Hand and Wrist—Different Varieties—COLOBUS VERUS—COLOBUS GUEREZA—Their Habitat and Peculiarities—Fossil Semnopitheci . 84

CHAPTER VI.

THE DOG-SHAPED MONKEYS (*continued*)—THE GUENONS.

THE GUENONS—Where they are Found—Early Notices of them—Resemblance to the Colobi and Macaques—Distinctive Peculiarity of the Group—Often seen in Menageries—Their Terror of Snakes—Peculiar Expression of the Face—Beauty of their Skins—Minor Divisions of the Guenons—THE DIANA MONKEY—Origin of the Name—Anecdotes of their Mischief—THE MONA MONKEY—Description of one at Paris—THE WHITE-NOSED MONKEY—Origin of the Name—THE TALAPOIN—Anatomical Peculiarities—THE GREEN MONKEY—Found in Senegal in abundance—THE RED-BELLIED MONKEY—THE RED MONKEY—Observed by Bruce—THE MANGABEY—Singularity of its Appearance—Special Structural Peculiarities 103

CHAPTER VII.

THE DOG-SHAPED MONKEYS (*continued*)—THE MACAQUES.

Their Description and Anatomy, and its reference to that of the Semnopitheci and Guenons—THE COMMON MACAQUE—Its Character—Appropriateness of the Name—Occasionally an Albino—THE ROUND-FACED MACAQUE—Found in China—Ideas of the Chinese about them—THE TOQUE, OR BONNET MONKEY—THE BHUNDER—Described by Cuvier—Their Thieving Propensities—Hindoo Tales of their Sagacity—THE MOOR MONKEY—BELANGER'S MONKEY—THE PIG-TAILED MACAQUE—THE MAGOT—One of the Commonest Monkeys—Described by Galen—Early Notices of—Predatory Habits—Abundant at Gibraltar—Probably come over from Africa—Similarity to the Baboons—THE WANDEROO—Account of one in the Zoological Society's Collection—Geographical Range of the Macaques . . 114

CHAPTER VIII.

THE DOG-SHAPED MONKEYS (*continued*)—THE BABOONS.

Early Accounts of the Baboon—Origin of the Name—Held as Sacred by the Egyptians—Used as the Emblem of Thoth—Brought into Europe in the Middle Ages—Their Literature—General Description of the Family—Structural Peculiarities—Brain—Skull—Geographical Distribution—THE SACRED BABOON—Found in Great numbers in Abyssinia—Formidable Antagonists—Size and Colour of the Male and Female—Anecdotes—Propensity for Spirituous Liquors and Thieving—THE GELADA BABOON—THE PIG-TAILED BABOON—Usually called Chacma—Description of it—Its Ferocity in Captivity—Le Vaillant's Monkey—THE SPHINX BABOON—Its Dexterity of Aim—THE ANUBIS BABOON—Its Locality and Food—Method of Running—THE COMMON BABOON—Often found in Captivity—Anecdotes—Anatomical Peculiarities 129

CHAPTER IX.

THE DOG-SHAPED MONKEYS (*concluded*)—THE BABOONS.

The Second Division of the Baboons—THE MANDRILL—Easily distinguished from the rest—Peculiar Appearance and Colour of the Face—The Cheek-ridges—Noticed by the Ancients—Brutality of its Disposition—"Jerry" at the Surrey Gardens—Their Wild State—Anatomical Peculiarities—The Back-bone and Liver—THE DRILL—Distinguished from the Mandrill—Probable Antiquity of these Baboons—Theories of their Relationship to other Animals—THE BLACK BABOON—Its Locality and Description—Probably a Forest Ape—General Summary of the Dog-shaped Quadrumana and Classification of the Group 151

CHAPTER X.

THE MONKEYS OF THE NEW WORLD.

THE CEBIDÆ—THE HOWLERS—THE WOOLLY MONKEYS—THE SPIDER MONKEYS—THE SAJOUS.

The Monkeys of the New World—How Distinguished from those of the Old—Their Division into Families—The First Family, THE CEBIDÆ, with Prehensile Tails—THE HOWLERS—Appropriateness of their Name—Where Found—General Description—THE YELLOW-TAILED HOWLER—Anatomical Peculiarities and Appearance of the Face—

PAGE

Other Members of the Family—The Black Howler—Its Locality—The Woolly Monkeys—The Caparro and Barrigudo—First noticed by Humboldt—Peculiarities of the Skeleton—The Spider Monkeys—Seen by Humboldt in the Brazilian Forests—Remarkable Power of the Tail—Flexibility of the Limbs—Conformation of the Brain—Other Species—The Coaita—Curious Stories of them in Captivity—The Chameck—The Black Spider Monkey—Its Geographical Range—Its Position in Sleep—The Variegated Spider Monkey—The Sajous—The Caiarara—Observed by Bates on the Amazon—Other Varieties—The Brown Sajou—The Capuchin Sajou Described by Brehm—Their Remarkable Dexterity and Cleverness—Diseases of Monkeys 164

CHAPTER XI.

THE CEBIDÆ (*concluded*)—THE SQUIRREL MONKEYS—DOUROUCOULIS—SAKIS.

General Description of the Second Division of Cebidæ—Without Prehensile Tails—The Squirrel Monkeys—Described by Buffon and Humboldt—Peculiarities of the Species—Anecdotes by Le Vaillant—A Tragic End—The Widow Monkey—Origin of the Name—The Onappo—Its Nocturnal Habits and Peculiar Cry—The Douroucoulis, or Owl Monkeys—General Description of the Family—Peculiar Formation of the Arm-bone—The Three-striped Owl Monkey—Described by Humboldt and Bates—The Red-footed Douroucouli—The Sakis—Remarkable Resemblance in the Face to Man—Structural Peculiarities—The Couxio—The Parauacú—The Monk—Description of the Brain—Other Varieties of the Sakis—Anecdotes of them—The Black-headed Sakis—General Description 185

CHAPTER XII.

THE MARMOSETS AND TAMARINS—HAPALE—MIDAS.

The Dentition of the Genus Hapale, or the Marmosets, or Ouistitis—The Face—The Paw-like Hands and Feet—Their Claws—The Skull and Brain, and the Nature of the Diet—The Common Marmoset—Its Habits—The Cloaked Marmoset—The Genus Midas—The Tamarins—Their Dentition—The Negro Tamarin—Its Habits—Midas Argentatum—Deville's Midas—The Silky Tamarin—Notes on the Arctopitheci in General 197

CHAPTER XIII.

GENERAL REMARKS ON THE MONKEYS.

The Classification of the Monkeys of the New World—The Geographical Distribution of the Genera—The Fossil Monkeys of the New and Old World and their Alliances—The Former Old Fauna of Europe, Asia, and Africa—The Resemblance of Monkeys to other Animals and Man 203

CHAPTER XIV.

THE LEMUROIDA.

THE GENERA INDRIS AND LEPILEMUR. HAPALEMUR.

The Name of the Genus Lemur popularly given to the Group—Lemuroida the Correct Name—Their Distinctive Characters—Their Hands and Feet—Ankle-bones—Tail—*Rete Mirabile*—Nostrils—Colour of the Eye—Ears—Teeth—Brain—Resemblance to Monkeys—Their Locality—Lemur at Liberty—Its Playfulness—Division of the Lemurs—Beauties of Madagascar—Genus Indris—Described by Grandidier—Their Locality—Colour—Fingers—Teeth—The Diadem Indris—Specimens at the British Museum—Little known about it—The Woolly Lemur—Described by Sonnerat—The Short-tailed Indris—Distinguished by its Tail—Its Skull—Genus Lepilemur—Their Teeth—Tail—The Weasel Lemur—The Grey Lemur—Specimens obtained by Pollen—Their Cry 210

CHAPTER XV.

THE LEMUROIDA (*continued*).

THE GENERA LEMUR AND CHEIROGALE.

Called by the French *Makis*—Restricted to Madagascar—Their Activity—Different Species—How to Distinguish them—The Ring-tailed Lemur—Reason for the Name—Tail—Colour of Body—Eye—Hand and Foot—Geographical Range—Anatomical Peculiarities—Playfulness in Captivity—The White-fronted Lemur—Specimen in the Zoological Gardens—The Lemur of Mayotte—Where Found—Colour—Manner of Life—The Mongoose Lemur—Description of one sent to Buffon—The Ruffed Lemur—Described by Ellis—Domesticated Specimens—The Black Lemur—Geographical Range—Hand—Foot—Genus Cheirogale—Bushy Tails—Resemblance to the Hapalemur—Nocturnal Habits—Difficult to Distinguish—The Forked-crowned Cheirogale—Wonderful Powers of Leaping—Cry—Reason for the Name—A Nest-making Variety—Specimens in the Jardin des Plantes Resemblance to the Galagos 225

CHAPTER XVI.

THE LEMUROIDA (*concluded*)—THE GALAGOS.

PAGE

THE GALAGOS—DEMIDOFF'S GALAGO AND THE MOUSE GALAGO—THE SENEGAL GALAGO—THE SENNAAR GALAGO—THE MAHOLI GALAGO—THE GRAND, OR THICK-TAILED GALAGO—MONTEIRO'S GALAGO—THE AFRICAN SLOW LEMURS—VAN BOSMAN'S POTTO—GENUS ARCTOCEBUS, OR BEAR MONKEY TRIBE—THE ANGWÁNTIBO—THE ASIATIC SLOW LEMUROIDS—THE SLOW LORIS—THE SLENDER LORIS—GENUS TARSIUS—THE SPECTRE TARSIER, OR TARSIUS—THE MALMAG—GENUS CHEIROMYS—THE AYE-AYE—The Puzzle of the Naturalists—Opinions regarding it—Specimen Examined by Owen—Feeding—Teeth—Hands—Classification of the Lemuroida—Geographical Distribution . 236

CHIROPTERA, OR WING-HANDED ANIMALS.

THE BATS.

CHAPTER I.

INTRODUCTION—CLASSIFICATION OF BATS—THE FRUIT-EATING BATS.

One of Æsop's Fables—Opinions of the Ancients regarding Bats—Scaliger's Statement of the Puzzle—Opinions of the Middle Ages—The True Position of the Bats—The Wing of the Bat—General Structure: The Breast-bone, Arms, Fingers, "Wing-membrane," Wings, Skull, Ribs, Pelvis, Legs—In Repose—Walking—The Teats—Organs of the Senses—"Blind as a Bat"—The Eyes—Spallanzani's Experiments—The Bat's Power of Directing its Flight in the Darkest Places—Their Food—In Winter Quarters—A Battue of Bats—FRUGIVOROUS AND INSECTIVOROUS BATS . . . 259

CHAPTER II.

SUB-ORDER I.—MEGACHIROPTERA, OR LARGE BATS.

PTEROPIDÆ, OR FRUIT-EATING BATS.

Characteristics of Fruit-eating Bats—Distribution—Diet—Flying Fox of Ceylon: its Habits, as described by Sir E. Tennent—The Flight of the *Pteropidæ*—Known to the Ancients—The Fruit Bats in the Zoological Gardens—INDIAN FLYING FOX—Diet—Dissipated Habits—GREAT KALONG—Linnæus's Description—In their Dormitories—NICOBAR, MALED, JAPANESE, AND GREY FRUIT BATS—GREY-HEADED FRUIT BAT—GOULD'S FRUIT BAT—ROUSSETTE—EGYPTIAN FRUIT BAT—HOTTENTOT FRUIT BAT—MARITIME FRUIT BAT—MARGINED FRUIT BAT—WHITE'S FRUIT BAT—HAMMER-HEADED BAT—HARPY BAT—GREATER HARPY BAT—CLOAKED FRUIT BAT—DWARF LONG-TONGUED FRUIT BAT—BLACK-CHEEKED FRUIT BAT—FIJIAN LONG-TONGUED FRUIT BAT 265

CHAPTER III.

SUB-ORDER II.—MICROCHIROPTERA, OR INSECTIVOROUS BATS.

HORSESHOE BATS AND MEGADERMS.

INSECTIVOROUS BATS—Mr. Dobson's Objection to the Name—Characteristics—Nasal Appendages—THE VESPERTILIONINE AND EMBALLONURINE ALLIANCES—The Fur in the two Alliances—THE HORSESHOE BATS—General Characteristics—Distribution—Diet—Carnivorous Propensities—GREATER HORSESHOE BAT—General Appearance—"Nose Leaves"—Habitat—THE LESSER HORSESHOE BAT—Habitat—THE MOURNING HORSESHOE BAT—THE AUSTRALIAN HORSESHOE BAT—THE ORANGE BAT—PHYLLORHINÆ—THE DIADEM BAT—Character of their "Nose Leaves"—Captain Hutton's Account of their Habits—THE PERSIAN TRIDENT BAT—THE MEGADERMS—THE LYRE BAT—Characteristics—Called Vampire by Europeans in India—Mr. Blyth's Account of a Megaderm's Blood-thirstiness—THE CORDATE LEAF BAT—THE AFRICAN MEGADERM—THE DESERT BAT 279

CHAPTER IV.

VESPERTILIONIDÆ, OR TRUE BATS.

The Genus *Vespertilio* and the Family Vespertilionidæ—Characteristics: Nostrils—Tail—Ears—Dentition—Diet—Distribution—LONG-EARED BAT—Ears—Distribution—Asleep—In Captivity—BARBASTELLE—Characteristics—Distribution—Habits—Flight—In Captivity—BIG-EARED BAT—TOWNSEND'S BAT—The Genus *Nyctophilus*—Its True Place—Characteristics—GEOFFROY'S NYCTOPHILE—PIPISTRELLE—Distribution—Diet—NOCTULE—Natural Food—Mr. Daniell's Observations—SEBOTINE—PARTI-COLOURED BAT—HAIRY-ARMED BAT—NEGRO BAT—KUHL'S BAT—NILSSON'S BAT—COROMANDEL BAT—THICK-FOOTED BAT—TEMMINCK'S BAT—WELWITSCH'S BAT—NEW ZEALAND BAT—MOUSE-COLOURED BAT—NATTERER'S BAT—DAUBENTON'S BAT—WHISKERED BAT—BLACK AND ORANGE BAT—PAINTED BAT—HARPY BAT—RED BAT—SCHREIBER'S BAT—BROWN PIG BAT—STRAW-COLOURED BAT. . . . 292

CHAPTER V.

EMBALLONURIDÆ, OR THICK-LEGGED BATS. PAGE

Characteristics of the *Emballonuridæ*, or THICK-LEGGED BATS—CUVIER'S FURY—The Genus *Saccopteryx*—STRIPED SACK-WINGED BAT—The Pouch or Sac in the Wing-membrane—Dentition—MOUNTAIN BAT—TOMB BAT—Origin of its Name—Dentition—The Peculiar Sac or Pouch under the Chin—Other Species of the Genus (note)—EGYPTIAN RHINOPOME—Difficulty of Assigning its True Place in the System—Characteristics—GREAT HARE-LIPPED BAT—Seba's Description—Linnæus's Mistake—Dentition—Distribution—The Genus *Nyctinomus*—CESTONI'S BAT—PALE CHESTNUT MASTIFF BAT—Distribution—Habits—SMOKY MASTIFF BAT—Habits—COLLARED BAT—Hideous Ugliness—Characteristics—NEW ZEALAND SHORT-TAILED BAT—Characteristics—Mr. Dobson on the Wing-membrane, Thumb, and Foot 312

CHAPTER VI.

PHYLLOSTOMIDÆ, OR VAMPIRES.

Distinguishing Marks of the *Phyllostomidæ*—Location—Diet—Blood-sucking Propensities—Exaggerations of the Older Writers—Testimony of Azara—Darwin's Evidence—Bat-bites—The Witness of Bates, Wallace, Fraser, Prince Maximilian—Conclusion of the Whole Matter—The Desmodonts and Javelin Bat—The Tongue in the Genus *Phyllostoma*—BLAINVILLE'S BAT—Extraordinary Development of Face and Head—OWL-FACED BAT—JAVELIN BAT—Allied Species—VAMPIRE BAT—Mr. Bates' Testimony to its Inoffensiveness, and Description of its Habits—NEUWIED'S LARGE-LEAFED BAT—GREAT-EARED LEAF BAT—SORICINE BAT—REDMAN'S BAT—SEZEKORN'S LEAF BAT—SPECTACLED STENODERM—JAMAICAN STENODERM—DESMODUS—Classification—Dentition—Blood sucking Propensities—The Bites—Stomachs of Desmodus, Frugivorous and Insectivorous Bats—Concluding Remarks 324

ORDER INSECTIVORA.

CHAPTER I.

COLUGOS—BANGSRINGS—JUMPING SHREWS—HEDGEHOGS—TANRECS—RIVER SHREWS.

Functions of the Insect-eaters in the Order of Nature—Their Leading Peculiarities—Classification—COLUGOS—Various Opinions regarding their Place—COLUGO, OR FLYING LEMUR—The *Patagium*—Parachute-like Membrane—Dentition—Offspring—Diet—BANGSRINGS—TANA—FERRUGINOUS BANGSRING—HOBSFIELD'S BANGSRING—LOW'S PTILOCERQUE—SHORT-TAILED BANGSRING—JUMPING SHREWS—ELEPHANT SHREW—ALGERIAN JUMPING SHREW—PETRODROME—RHYNCHOCYON—HEDGEHOG—Characteristics—Distribution—Diet—Attacks Snakes and Vipers—Taste for Eggs and Game—Its "Spiny Skin"—"Rolled up"—Enemies—Female and Young—LONG-EARED HEDGEHOG—COLLARED HEDGEHOG—BULAR—TANRECS—TANREC—TENDRAC—TELFAIR'S TENDRAC—RICE TENDRAC—EARED EARTH SHREW—AGOUTA—ALMIQUI—WEST AFRICAN RIVER SHREW 342

CHAPTER II.

GOLDEN MOLES—MOLES—DESMANS—SHREWS.

General Description of the Golden Mole Family—Their Points of Difference from the True Mole—THE CAPE GOLDEN MOLE Its Varieties—The Family of True Moles—THE COMMON MOLE—Described—Distribution—Teeth—Fore-limbs—Breast-bone—Not a Miserable Creature—Extreme Voracity—Diet—His Blindness a Popular Error—A Thirsty Soul—His Fortress The Roads leading to it—Speed of a Frightened Mole—"Mole-hills"—A-wooing—His Strong Family Affections—His Persecution a Doubtful Benefit—THE BLIND MOLE—Several Allied Species—THE STAR-NOSED MOLE—Its Snout THE COMMON SHREW MOLE—Other Species in the United States—The Family of Desmans—THE DESMAN—Its Otter-like Habits—Its Trunk—THE PYRENEAN DESMAN—THE HAIRY-TAILED MOLE-SHREW—The Family of Shrews—THE COMMON SHREW, OR SHREW-MOUSE—Superstitions about it—DEKAY'S SHREW—THE GARDEN SHREW—THE TUSCAN SHREW—THE RAT-TAILED SHREW—THE WATER SHREW—Essentially Aquatic—Its Prey—Allied Species—THE TIBETAN WATER SHREW—THE TAILLESS SHREW—Concluding Remarks—Classification—Distribution—Affinities . . . . . 35.

LIST OF ILLUSTRATIONS.

PAGE

Orang-utan and Chimpanzees in the Berlin Aquarium . . . . . *Frontispiece.*
Group of Apes and Monkeys, and a Lemur . . 1
American Monkey, with Prehensile Tail . . . 2
One of the Anthropomorpha—The Chimpanzee . 3
One of the Cynomorpha—The Baboon 4
Group of Lemurs 5
Foot and Hand of a Monkey—A Catarhine Monkey—A Platyrhine Monkey—Monkey with Cheek Pouches 6
The Male Gorilla 8
Female Gorilla and Young 9
Front View of the Skull of the Gorilla . . . 10
A Family of Gorillas 13
Face of the Gorilla 15
Palm of the Foot of Young Gorilla—Back of the Hand of Young Gorilla 16
Side View of the Skull of Gorilla 17
The Teeth of the Gorilla 20
Skeleton of the Gorilla 21
Throat of Gorilla 22
Forest in the Gaboon Country—The Land of the Gorilla 24
Bones of the Fore-arm and Arm of the Gorilla—Side View. Shoulder or Blade-bone . . . 25
Hand-bones of the Gorilla 28
Hunting the Gorilla 32
Bones of the Ankle and Foot of Man—Bones of the Ankle and Foot of Gorilla 33
Young Gorilla and Dog 38
The Nschiego Mbouvé 40
Skeleton of Nschiego 41
Skull of Nschiego 42
The Koolo-Kamba 44
Portrait of a Young Soko 47
A Soko Hunt 48
The Chimpanzee 49
A Village in the Gaboon Country 52
Sick Orang-utan 53
Brain of Chimpanzee 57
Orang-utans . . . . . *To face page* 61
Front and Side Face of the Orang 61
The Orang at Bay 64
A Family of Orang-utans 65
The Orang and its Nest 68
A Young Orang 69
The Air Pouches of Orang—The Brain of Orang . 71
Wrist-bones of Orang 72
The Siamang 73
Skeleton of the Siamang 76

PAGE

Group of Siamangs and Gibbons . *To face page* 77
The White-handed Gibbon 77
Skull of Hoolook 79
The Hoolook 80
The Wooyen Ape 81
The Agile Gibbon 82
Jaw of the Gibbon—Back of Jaw of the Agile Gibbon 83
Face of the Black-crested Monkey 85
The Negro Monkey 88
The Long-nosed Monkey 89
Young Long-nosed Monkey 90
Stomach of the Long-nosed Monkey 91
The Sumatra Monkey 92
The Doue 93
The Crowned Monkey 96
The Priamus Monkey 97
Colobus Verus 100
The Guereza 101
The Diana Monkey 104
Face of the Diana Monkey 105
The White-nosed Monkey 109
The Head and Shoulders of the Talapoin . . 110
The Green and Red Monkeys . . *To face page* 111
The Red-bellied Monkey 112
The Mangabey—The Foot and Hand of the Mangabey 113
The Common Macaque 116
The Toque 117
The Bhunder, and a Bonnet Monkey . . . 120
The Moor Macaque 121
The Pig-tailed Macaque 124
The Magot 125
Wrist-bones of the Magot 126
Face of the Wanderoo 127
The Wanderoo 128
Cynocephalus 131
Judgment Scene from an Egyptian Monument . 132
Baboons upon an Ant-hill 133
Brain of the Baboon 136
The Sacred Baboon . . . *To face page* 137
View in Abyssinia 137
The Sacred Baboon 140
Young Hamadryas 141
A Village in Nubia 142
The Pig-tailed Baboon 145
Skull of the Chacma 147
Skull of the Anubis Baboon 149
The Anubis Baboon 152
The Common Baboon 153

PAGE

The Mandrill 156
Young Mandrill 157
Skull of the Mandrill 158
The Drill 160
The Black Baboon 161
The Skeleton of the Mandrill 162
A Group of Howlers 165
Bones of the Tail of the Howler 167
Section of Head and of Air Sac of the Howler—Upper Part of Breast-bone and Collar-bones of the Howler—Brain of the Howler . . . 168
Yellow-tailed Howler and Young 169
The Caparro 170
Group of Spider Monkeys . . . *To face page* 173
Brain of the Spider Monkey 173
Jaw of the Spider Monkey 174
The Coaita 176
The Chameck 177
The Black and Variegated Spider Monkeys . 179
The Hooded Spider Monkey 180
The Brown Capuchin 181
The Cai 184
The Callithrix Amictus 188
Arm-bone of Owl Monkey 189
The Red-footed Douroucouli 190
Brain of Monk 192
The Monk 193
The Couxio 194
The White-headed Saki 196
The Common Marmosets 197
Hand-bones of Marmoset—Foot-bones of Marmoset . 198
Deville's Midas 201
Skull of Marmoset 202
Head of the Black Howler 205
Young Orangs 209
Group of Lemuroids . . . *To face page* 211
Lemuroids at Home in Madagascar 212
Head of Indris (Propitheeus) Verrauxii, to show Lemuroid Nostrils 213
Eye of Lemuroid, showing Contraction and Dilatation of Pupil—Upper Surface Brain of Lemur Catta 214
Side View and Under Surface of the Tongue of a Lemuroid 215
Garnett's Galago 216
Skull of Black Indris, showing Adult Dentition—Milk Dentition of Indris 219
The Diadem Indris and the Woolly Indris . . 220
The Black or Short-tailed Indris 221
The Weasel Lemur 224
The Grey or Broad-nosed Lemur 225
Ring-tailed Lemurs . . . . *To face page* 227
The Mongoose Lemur, or Woolly Macaco . . 229
The Ruffed Lemur 230
Skeleton of the Ruffed Lemur 231
Head of the Black Lemur 232
The Forked-crowned Cheirogale 234
The Maholi Galago and the Senegal Galago . 236
Ears of Maholi Galago, contracted and open . 237
The Muscles and Tendons of the Tail of Grand Galago—Foot-bones of Grand, or Thick-tailed Galago 238
Monteiro's Galago 239

PAGE

Palm of Hand of Garnett's Galago—Sole of Foot, with long heel of Garnett's Galago . . . 240
The Potto in its Sleeping and Waking Attitudes . 241
The Angwántibo 242
Hand and Foot of Arctocebus 243
The Slow Loris 244
Rete Mirabile—Slow Loris 245
The Slender Loris, showing its Attitudes and Habits 247
The Tarsius 249
The Aye-Aye 251
Forest Scene in Madagascar 253
Bones of the Hand and Foot of Aye-Aye . . . 256
Skull of the Aye-Aye (side and front view) . . 257
Marsh Bat 258
Skeleton of the Mouse-coloured Bat 260
The Sternum of Flying Fox 261
Barbastelle Walking—Head of Long-eared Bat . 263
Head of the Spectacled Vampire 264
Head of the Kalong 266
Fruit Bats of Ceylon at Home . . . *To face page* 267
Dentition of the Egyptian Fruit Bat 267
Representation of a Fruit Bat on an Egyptian Monument 269
Collared Fruit Bat with Young 270
Kalong 272
Head of the Maned Fruit Bat—Head of the Grey Fruit Bat 273
The Ronssette 275
Head of the Margined Fruit Bat 276
The Hammer-headed Bat 277
Teeth of the Dwarf Long-tongued Fruit Bat . . 278
The Black-cheeked Fruit Bat 279
Hairs of Bats, Magnified 280
Head of the Greater Horseshoe Bat 281
The Greater Horseshoe Bat 282
Head of Lesser Horseshoe Bat 283
Head of the Mourning Horseshoe Bat . . . 284
The Orange Bat 285
Head of the Male and Female Diadem Bat . . 286
Head of the Persian Trident Bat 287
Head of the Lyre Bat—Teeth of the Lyre Bat . 288
Head of the Cordate Leaf Bat—Head of the African Megaderm 289
The African Megaderm—Head of the Desert Bat . 290
The Desert Bat 291
Dentition of the Thick-legged Bat 292
British Bats at Home . . . *To face page* 293
Long-eared Bats in Flight 293
Long-eared Bat Sleeping 294
Head of Barbastelle 295
Ear and Head of Townsend's Bat 296
Geoffroy's Nyctophile 297
Pipistrelle in Flight 298
Head of Noctule 299
Head of Parti-coloured Bat 301
Head of Temminck's Bat—Wolwitsch's Bat . . 303
New Zealand Bat 304
Head of Mouse-coloured Bat 305
Black and Orange Bat 307
Skull of Harpy Bat—Skull of Red Bat . . . 309
Foot and Thumb of the Brown Pig Bat . . . 311
Head of Straw-coloured Bat 312

PAGE

Dentition of Striped Sack-winged Bat—Wing of Striped Sack-winged Bat, from below—Arm of Striped Sack-winged Bat, from above . . 313
The Mountain Bat 314
Skull of Tomb Bat—Dentition of Tomb Bat . . 315
Head of Male and Female Long-armed Bat—Head of Male and Female Black-bearded Bat—Skull of Rhinopome 316
Egyptian Rhinopome—Head of Great Incre-lipped Bat 317
Skull and Front Teeth of Cestoni's Bat . . . 318
Head of Cestoni's Bat 319
Head of Collared Bat 321
The Collared Bat 322
Head of New Zealand Short-tailed Bat—Teeth of New Zealand Short-tailed Bat—Thumb and Foot of New Zealand Short-tailed Bat . . . 325
The New Zealand Short-tailed Bat 327
Skull of Javelin Bat 325
Mouth of Spectacled Stenoderm—Head of Blainville's Bat 328
Skull and Dentition of Blainville's Bat—Blainville's Bat 329
Head of Owl-faced Bat 330
Head of Javelin Bat—Head of Vampire Bat . . 331
Head of Soricine Bat 333
Redman's Bat 334
Skull of Desmodus 338
Desmodus 339
Stomach of Desmodus—Stomach of Long-eared Bat—Stomach of Pteropus 340
Low's Ptilocercue 342

PAGE

Skeleton of Shrew—Dentition of Hedgehog . . 343
Hind Foot of Colugo—Bones of Hind Foot of Colugo 345
Lower Incisors of Colugo—Colugo 346
Skull of Colugo 347
Dentition of Ferruginous Bangsring—Tana, Golden-tailed Variety 348
Sole of Right Hind Foot of Elephant Shrew—Elephant Shrew 351
Sole of Right Hind Foot of Petrodrome—the Rhynchocyon 352
The Hedgehog 354
The Bulau 358
1. Tendrac; 2. Telfair's Tendrac; 3. Tanrec *To face page* 359
Dentition of Tanrec 359
The Agouta 362
Upper Jaw of West African River Shrew . . 363
Lower Jaw of West African River Shrew—The West African River Shrew 364
Skull of Golden Mole—Dentition of Golden Mole . 365
Sternum of Golden Mole—Fore Foot of Golden Mole 366
The Common Mole 367
Dentition of Common Mole—Fore Limbs of Common Mole—Sternum of Common Mole . . . 368
Mole's Fortress 370
Side View of Snout of Star-nosed Mole—Front View of Snout of Star-nosed Mole 372
Dentition of Desman 375
1. Pigmy Shrew; 2. Common Shrew; 3 and 4. Water Shrew . . . . *To face page* 377
Dentition of Common Shrew 377
Rat-tailed Shrew 379

INTRODUCTION.

THE Natural History of Animals has always been a most interesting and instructive subject, and its popularity increases year after year. It is a branch of knowledge which is entertaining at every age, and it is a favourite study with men of every race and country, and of every intellectual capacity. All children delight in having their little tasks associated with pictures of animals, and the alphabet is learned all the more readily by its being illustrated with spirited drawings of household pets and the terrible creatures of the woods. The marvels of the intelligence of the dog and horse are inexhaustible sources of delight to young readers; and there are few greater pleasures than those which are felt when living animals, whose descriptions and habits have been the subject of instruction and amusement, are seen in some large menagerie or zoological gardens. On the whole, it is probable that few books are so interesting to young men and women as those which relate to animals, and it is their study which, in the majority of instances, leads to the desire for further knowledge of Natural History. The young student soon begins to yearn for information regarding the manner in which different creatures live; how some breathe air, how others live in water; how it is that some fly and others crawl; and he desires to connect the peculiar construction of animals with their method of life. Or he may be content with endeavouring to understand the names of animals, and the reasons why they are arranged or classified in a particular manner by scientific men.

As years roll on, if the interest in Natural History has not diminished, the man, with increasing intelligence and scope of reading, masters the knowledge desired in his youth, and has the opportunity, should he care to grasp it, of the highest intellectual enjoyment. He can enter into the consideration and discussion of the mysterious problems of life: of its origin; of the reasons why animals differ; why they are distributed here and there, or limited in their position in the world; what connection there may be between those of the past and of the present, and of the relation between the creation and the Creator.

Besides this, even should he not aim so high, the man who has had a slight training in Natural History often employs his knowledge for the benefit of art and commerce. How beautiful are the representations of animals on some old coins, how grotesque are those on others! Yet the most correct, and, therefore, the most beautiful, were the result of the careful study of Nature. What benefits to men have resulted from the production of certain breeds of horses, sheep, and oxen! But it has been the study of Nature, and of the laws of the powers of inheritance, which led to most of these results: and thus the practical man is dependent upon the student for his success.

Notwithstanding the interesting nature of the study of the Natural History of Animals, there is

certainly more interest taken in it during early life than later on. As a rule, men have no time for it, or they find that, after gaining a certain amount of knowledge, they must study hard if further progress is to be made. Moreover, the vast amount of useless things which had to be learned at school and college have no relation to Natural History, except, perhaps, to convey erroneous ideas and to teach fables, so that this important science has generally to be begun in earnest after the usual education has been completed. When the determination has been made to learn the Natural History of Animals, the student will have to study two separate, yet inter-dependent, branches of knowledge, namely, Zoology and Comparative Anatomy: for the one considers the external shape, habits, distribution, and classification of animals, and the other refers to their internal construction, anatomy, and physiology, and the relation which the internal parts bear to the external in the scheme of classification. These studies are evidently inseparable.

Now, it is the fact that, owing to the importance of Comparative Anatomy to those who study the Anatomy of Man, it is much more frequently learned than simple Zoology. Comparative Anatomy is useful to the medical man, but Zoology is not, and therefore the majority of students whose previous education has led them up to Natural History care but little for the classificatory part. It is equally true that the names and the apparently complicated methods of expression used by zoologists deter most people from the study. If this is a correct view of the relation of the Natural History of Animals to our education, and to the advance of our intellectual culture, it is evident that there is a weak point in the method of the instruction of this charming science during that age when young people begin to inquire for more solid information. The story-book has been read, and the heavy work on Zoology and Comparative Anatomy is as yet sealed, and hence books are required in advance of the one which will lead up to the other; books which—whilst they entertain—instruct and convey, in simple language, the results of the best and latest scientific inquiries. This kind of literature should, moreover, be sufficiently meritorious to attract the general reader who may desire information in any particular portion of the Natural History of Animals.

The book of which this is the Preface has been written in order to obviate the difficulties which have been alluded to, and to form a useful and entertaining Natural History of Animals. It is the result of the work of several English naturalists—of men who have felt the want of such a book in their own studies, and who have had to encounter the difficulties which it is trusted that it will remove. Every endeavour has been made to explain the most interesting facts simply and correctly, and to unite the studies of Zoology and Comparative Anatomy. The anecdotes of the instinct and habits, and of the methods of the capture of animals, have been given so as to illustrate particular gifts and the actions of important organs and structures.

The plan of this Work is not to open with a classification of animals, the majority of whose names and shapes are entirely unknown to the reader, but to describe the shape, nature, and habits of groups of creatures, and then, when they have become familiar, to arrange and classify them. In a popular work it seems more desirable to proceed upon a plan of this kind, than to lead off with an introduction dealing with the nature and importance of Natural History studies, with the abstract ideas of classification, and with the explanation of the necessity of dividing the Animal kingdom according to the principles of Comparative Anatomy. For, obviously, such an introduction would to a large extent defeat the very objects with which this Work has been undertaken.

It is necessary, however, to make a few observations on what is termed classification and its nature. Animals are classified by their resemblances and differences. Those creatures which resemble each other more than others are grouped together, and are separated from dissimilar groups. The first act in classification is to distinguish one animal from others by differences in the shape and internal construction, and the second is to group together the beings whose differences are small. A kind or species is a letter of the Zoological Alphabet, and it is usually said to refer to beings which produce others like unto themselves. A genus is a group of species closely resembling each other; a word in zoological language made up of few or many letters of the alphabet. There may be few or many species in a genus, and whilst some of them very closely resemble each other, others are not quite so much alike; and these link on one genus to another. The notion of a genus is to include a number of kinds in a group which has a character given to it: that is to say, certain peculiarities of shape and of anatomy. It will be obvious that the genus is an artificial affair, and is necessary for the purpose of making science easy.

In order to explain this, look at a domestic cat, a lion, a tiger, a leopard, and a cheetah, and it will be observed that there are differences between them in shape and colour which cause them to be separated into distinct SPECIES. They all have some points of construction in common; and, therefore, they are classified together as five species of a GENUS—the genus *Felis*.

Then consider the figure and colour of a hyæna, and of a civet, and study their internal anatomy, and it will be found that although there are differences between them which are sufficient to necessitate the placing of the hyænas in one genus (*Hyæna*), and the civets (*Viverra*) in another; yet the genera are closely united or allied, in consequence of their possessing many similarities.

On comparing the genus *Felis* with the genera *Hyæna* and *Viverra*, it will be noticed that the last two resemble each other more than they do the first, and thus two FAMILIES are formed—one the *Felina*, to comprehend the genus *Felis;* and another the *Viverrina*, to include the genera of hyænas and the civets. But the slight resemblance between these families is sufficient to cause them to be grouped in an ORDER which is called Carnivora, or that of carnivorous beasts.

Again, the Monkeys and Sloths do not resemble each other in shape and internal construction sufficiently to be placed in the same order even, but they and the Carnivora, and many other animals, suckle their young. They may, therefore, be separated, in a classification, from other animals which fly and lay eggs, and do not suckle: as the birds. The Birds form one CLASS, and the Mammalia, or animals that suckle their young, form another. Other Classes are formed by the Reptiles, Amphibia, Fishes, etc.

All the animals of these numerous Classes have a back-bone; but if we examine a nautilus, a snail, a beetle, a worm, a coral, or an animalcule, nothing like an internal skeleton made up of bones, some of which are placed inside the back, can be discovered. Hence all the animals can be arranged into two SUB-KINGDOMS, those with and those without back-bones, or the Vertebrata and the Invertebrata. (The name *vertebrata* is taken from the Latin word *vertebra*, which means a turning-joint in the body, or a back-bone.) Those are the sub-kingdoms of the animal KINGDOM, which is so called in contradistinction to the *kingdom* of plants.

It must be remembered, however, that the best classification is but an attempt of a finite understanding to arrange the infinitely variable things of Nature. It is but an artificial and arbitrary arrangement which is necessary for study: for were the whole truth before us, there would be no

classification which would depend on marked differences in shape and internal construction. Were the figures and anatomy of every animal that has lived, and of every creature which is now living on the globe, placed before us, the gaps which enable one genus to be separated from another would be filled up, and even species would cease to be distinguished. But, in spite of the artificial nature of the classifications, there is this to be said of them: that they give some faint indications of the philosophy of creation. The differences and resemblances of animals relate to structures of the body which have been inherited from creatures that lived in the remote past; and we glean this when it is known that the young unborn of one genus resembles the old and fully-formed creatures of kinds belonging to other classes which preceded it in the history of the globe, and when it is shown by the microscope that some of the parts of the bodies of the most insignificant animals of the invertebrate sub-kingdom resemble those of the most gifted of animals.

A classification thus opens out a little of the scheme of Nature, and it proves that the resemblances and differences of animals are not matters of chance, but that there is a law which has produced them. Such a law, as yet perhaps not fully comprehended, is Man's idea of the action of the will of the Divine Creator.

GROUP OF APES AND MONKEYS, AND A LEMUR.

CLASS MAMMALIA.

ORDER I.—QUADRUMANA.—THE APES AND MONKEYS.

CHAPTER I.

INTRODUCTION—THE MAN-SHAPED APES—1. THE GORILLA (*Troglodytes Gorilla*).

The World of Monkeys, and its Division into great Groups—Distinction between the Old World and New World Monkeys—Classification of Monkeys—The GORILLA, Ancient and Modern Stories about it—Investigations of Savage and Du Chaillu—General Description—The Head, Brain, Teeth, Taste, Smell, and Voice—The Air Sacs, and Ear—The Limbs and Muscles—Method of Climbing—Diet—Hunting the Gorilla—Attempts to Capture Alive—A Tame Gorilla.

IF one of each kind of the Apes and Monkeys which are now living on the globe could be collected and placed in a large zoological garden, and if those which lived in former ages, and whose skeletons have been discovered by geologists, could be brought to life, and added to the whole, they would certainly form a very amusing and remarkable assemblage. What endless fun there would be, what scamperings, skirmishes, and quarrels would take place; how they would grin, chatter, and pull tails all the live-long day; and as evening began, how some, which had been quiet spectators before, would commence howling, and how others would rush about amongst their tired and sleepy companions, with noiseless bounds until the return of daylight!

If each of these representative Monkeys could give an account of itself, whence it had come, how it lived in its native forests and woods, and what it did with itself all day, a most interesting and

novel Natural History book could be compiled, for only the histories of a few have been written, and they are by no means always veracious. They would have come from Asia and many of its islands, from Africa, from South America, and the Isthmus to the north, and Europe would have sent one from the rocks of Gibraltar; and yet, unless those of the same country had been properly introduced, either by Dame Nature or by the chapter of accidents incident to such a very unlikely meeting as we are imagining, they would not know many of their fellows. They are exclusive in their habits, and their particular parks and forests are limited in extent, and sometimes very much so. Of course, there are some exceptions, and many kinds which roam over large countries, and are even found in different islands, have gained the superior intelligence and the ready affability and easiness of intercourse characteristic of the cosmopolitan and traveller. Every kind of temper and capacity would be shown; the Gorillas would probably be shy and cross, the Chimpanzees lively and kind, the Baboons grumpy, the Spider Monkeys restless, and most of the

AMERICAN MONKEY, WITH PREHENSILE TAIL.

Macaques impudent and cunning—the result of a knowledge of Apes and of many Monkeys. There would be every shade of colour, and of shape and size; there would be many without tails, some with stumps, and others with long tails of no great use except to afford temptation to the mischievous; and not a few with fine large ones useful in the extreme, by acting as a fifth limb. Many would have very human faces and sharp eyes, others would look more like dogs, and fierce enough, and there would be every variety of posture. Some would sit very well, others would go on all-fours, and there would be others swinging with their long and strong arms, and making tremendous jumps and bounds assisted in some by the prehensile tail. Some would want one kind of fruit, and others different kinds of vegetables, but only two or three tiny little ones would care much about grubs and eggs. All would have the very best possible limbs for climbing, grasping, picking, and stealing, and all would have good hands, that is to say, fingers and thumbs and wrists, in front, and foot-hands, that is to say, feet with a great thumb-like toe behind. In a general sense they would all be four-handed or Quadrumanous, and this peculiarity would distinguish them from any interlopers who might have got into the assemblage unasked.

It may be doubted whether the most scientific of the scientific could do much in the way of science at first with such varied and amusing creatures before him; but the mind will attempt to compare and notice differences under all sorts of circumstances, and therefore some general truths would

possibly be got at amidst all the noisy debates, divisions, and cheers and counter-cheers of this Apes' Parliament. There would be clearly two sides to this house of representatives, the Americans and the Old World-ites, and the most uncritical observer would separate them. It never entered into the mind of a Monkey of the Old World to have a tail which would be as useful as another leg and hand, and as manageable as if it had an eye at its tip—that is an invention of Dame Nature in the American tropics, and is an evident improvement. Now this tail is visible enough, and so is another American peculiarity. The Monkeys there have a broad end to the nose, and the openings of the nostrils look outwards, being separated by a thick gristle; but those of the Old World have a thin gristle in the same place, and the nostrils are not wide apart but open in front, more or less like those of men and dogs. Here are, then, two "parties," those with nostrils wide apart with a wide and thick gristle—"broad

ONE OF THE ANTHROPOMORPHA—THE CHIMPANZEE.

noses," called in scientific language "Platyrhines"*; and those with the nostrils "looking downward," or "Catarhines."†

The great American section, or that of the broad-noses, is split up to a certain extent, for all have not long prehensile tails, those of some being short; and others have them feeble in strength and almost brushy with fur. Here are, then, the means of readily knowing one set from another, so far as these far travelled Monkeys are concerned.

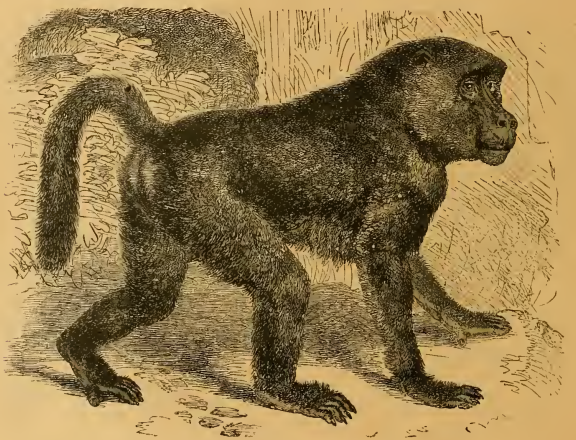
The Old World section, with its close and downward-looking nostrils, at first sight appears very united, but after a little noticing there seem to be many different groups in it. Firstly, the commonest kinds make up for the absence of a clinging tail, such as their American cousins have, by having something which the Transatlantics would be glad of, namely, cheek pouches—comfortable receptacles for nuts and such delicacies within the mouth, where food can be kept as in a cupboard, until it

* πλατύς, flat or broad; ῥινές, nostrils. † κατά, downwards; ῥινές, nostrils.

is required, or can be enjoyed in safety. These are the valuable properties of many of the smaller African tribes. Then they also have, in the absence of soft clothes and comfortable chairs to sit upon, fur or hair and a natural hardness or "callosity," or seat, which does not wear out, and which is often strangely coloured. Another group has no cheek pouches, but it possesses the callosities, and these less favoured creatures come mainly from Asia and the great islands, and only a few from Africa.

Finally, the most important group of the section consists of the large Apes, with neither tails, callosities, nor cheek pouches, but having very man-like features; for instance, the great Troglodytes, Chimpanzees, and Orangs, the first two from Africa, and the last from the great Asiatic islands and the mainland.

These tribes could be, with more study (especially if the merry company were broken up by the



ONE OF THE CYNOMORPHA—THE BABOON.

anatomist taking them one by one and dissecting them), divided over and over again, and separated into kinds or species, which would not, however, always tally with the corresponding arrangement of the naturalist, who would go by the skin and the outside of the animals.

One thing would be quite clear to every one, and that is that some of the creatures greatly resemble man at first sight, and that although this likeness diminishes with study, still there is a group, which deserves the title of the "man-shaped." Others form a group which go usually on all fours, looking like dogs, more or less, and they are the "dog-shaped," but they of course retain the more or less man-like peculiarities which characterise the whole of the Monkeys.

Hence, after all these divisions and differences and resemblances have been mastered, it would be found that the noisy assemblage could be arranged as follows:—

1.—Catarhines.—Old World Monkeys, man-shaped and dog-shaped.

2.—Platyrhines.—New World Monkeys.

The first section, the *Catarhines*, may be divided into the man-shaped, or in the Greek the *Anthropomorpha*, and the dog-shaped, or the *Cynomorpha*.

Or they may be arranged as those, with: 1, cheek pouches and callosities, for instance, the Baboons; 2, those with callosities only, the Monkeys; and 3, those without either, and without a tail, the Apes.

The second section, or the *Platyrhines*, may be divided into those: 1, with prehensile tails; and 2, those with the tails not prehensile; and 3, those whose tail is furry.

This great array of manikins (whence they get their name of Monkey—the word *homunculus*, "a sorry little fellow," having possibly something to do with it) is formed by creatures next to man, the highest in the scale of animals. They could be very readily distinguished from all others, were it not for the existence of a group of beings which resemble them in some particulars. These are the next lowest in the scale, and they have thumbs on the hands and thumb-toes on the feet, but their fur is woolly, and they are cat-like in shape. They are called the Lemurs, or by some zoologists "Half Apes." These Lemurs only resemble in a slight degree some of the

GROUP OF LEMURS. (From the *Transactions of the Zoological Society*.)

Monkeys of the New World, but they are more like them than any other animals, and therefore are classified with them.

The order of beings to which these various creatures belong is known by the name of "Primates," which implies the rank they hold in the scale of creation. Man stands first, very distinct in his intellectual powers and spiritual gifts from the most intelligent of the Quadrumana and as much superior to them in his construction. Then comes the world of Monkeys, the "man-shaped" at the head, and the little marmosets, with furry tails, at the bottom of the array, and linked on to these are the Half Apes or Lemurs. They all form a great order of the animal kingdom which stands first and at the head of all other orders of the animal world.

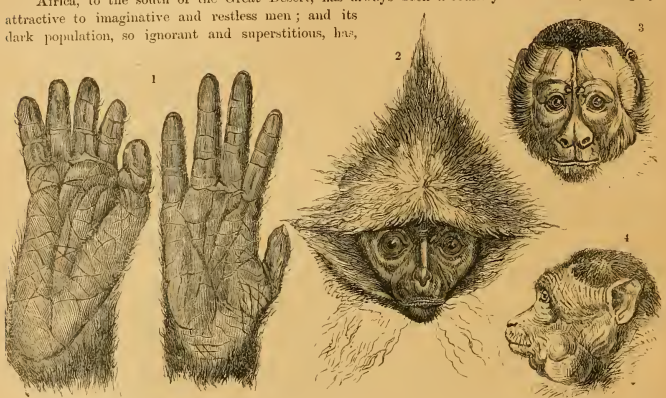
But what would the old Monkeys whose bones have been dug out of strata which are older than the Himalayan mountains and the Alps say could they visit such a collection as that suggested? They would recognise their fellow-monkeys, but would look upon them as pigmies in size. They would be few in number, for though Monkeys go the way of all flesh very rapidly, skeletons of them are very rarely found, so rarely indeed that many Indians believe that the other Monkeys bury them. The fact is, that there are plenty of Jackals, to say nothing of birds of prey, ready to snap up a dead, dying, or invalid Ape, and to turn its protoplasm into their own. Some few tumble into holes, and may be preserved there, and probably that was how the old bones were hidden up. The old kinds resembled the new more or less, but for the most part those which have been carefully examined

were larger than the corresponding modern species. They were as great Apes in their nature as are the present, and had this advantage, that their roaming ground was wider, for they lived in Europe as well as in the countries where their modern representatives are found. Nevertheless, even in those old days the Catarhines were kept to the Old World, and the Platyrhines enlivened the American forests alone.

In the great order of the Primates, after man, stand the man-shaped or anthropomorphous* Apes, the Great Tail-less. They are inhabitants of equatorial Africa, and of the large Asiatic islands and the adjacent mainland, and first and foremost amongst them is

THE GORILLA.

Africa, to the south of the Great Desert, has always been a country of wonders, and highly attractive to imaginative and restless men; and its dark population, so ignorant and superstitious, has,



1. FOOT AND HAND OF A MONKEY. 2. A CATARHINE MONKEY. 3 A. PLATYRHINE MONKEY. 4. MONKEY WITH CHEEK POUCHES.

from its love of the marvellous, shadowed the truth with much mystery. Hence, travellers in those tropical regions, which are so fatal to Europeans, have from the earliest times told of the man-like creatures they had heard of and sometimes seen; and they have associated them in the equatorial part of the continent with human dwarfs, pigmies, and monsters. For centuries these degraded human races have been sought after, and now whilst it is admitted that dwarfed men exist, it has come to light that most of the stories which led to the belief in their hideous associates were derived from the existence of large man-like Apes—creatures of dread to the natives—whose traditions are full of credulous anecdotes about them. Hidden in the recesses of vast forests, where the silence of nature is intense, and moving with great activity, where men can hardly follow, these animals acquired most doubtful reputations, and their ugly personal appearance, so suggestive of violence, was magnified in every way in the eyes of the timid natives.

So dreaded were these Apes, and so environed were they with a superstitious mystery, that Europeans had travelled and traded close to their haunts for centuries before one of them was seen by any other eyes than those of the timid negroes. Many stories about them had long been

* Ἄνθρωπος, man; μορφή, form or shape.

told, and indeed some of them are as old as the days of the Carthaginians. For instance, Hanno, a Carthaginian, was ordered to sail on a voyage of discovery round Africa some centuries before Christ, the exact date not being fixed; and he sailed and rowed in his galleys out of the present Straits of Gibraltar, and coasted southwards until he came to the great bay, probably somewhere about the Gaboon River, near the equator, in Western Africa. It is stated in the history of his voyage:—

"On the third day, having sailed from thence, passing the streams of fire, we came to a bay called the Horn of the South. In the recess there was an island like the first, having a lake, and in this there was another island full of wild men. But much the greater part of them were women with hairy bodies, whom the interpreters called Gorillas. But, pursuing them, we were not able to take the men; they all escaped, being able to climb the precipices, and defended themselves with pieces of rock. But these women (female Gorillas), who bit and scratched those who led them, were not willing to follow. However, having killed them, we flayed them, and conveyed the skins to Carthage, for we did not sail any further, as provisions began to fail."

Probably the streams of fire were a part of a volcanic eruption. Written in the *Periplus* or voyage of Hanno this story is thoroughly African, and might have been the model upon which hundreds of later ones have been formed, for it is a combination of the novel in nature, and of what is true and false. It is curious that a commander of so civilised an expedition, and a man whose eyes had been accustomed to the grace of Grecian statuary and to the beauty of his own country-women, should have mistaken a Gorilla for one of the fair sex; and, moreover, it is possible that from the mounting of the rocks, and the flinging of stones by the males, the whole were Baboons. Nevertheless this is the oldest record of the name which is associated with the most interesting of modern discoveries, and it accounts for many stories which were kept floating in the thoughts of successive generations of travellers.

Gradually the truth came forth, but not until many Europeans had wandered in Gorilla Land. One Andrew Bartlett was an English sailor, who got caught by the Portuguese for some reason or other, and was kept a prisoner in Angola, which is situated nearly ten degrees south of the line, and near the great virgin forests, which are the haunts of the Gorilla and Chimpanzee, and his "strange adventures" were published in 1625, by Purchas, in "His Pilgrimages."

Battel speaks of two monsters which excited the fears of the natives. "The greatest is called *Pongo*, in their language, and the lesser is called *Engeco*. This Pongo is in all proportion like a man, but that he is more like a giant in stature than a man: for he is very tall and hath a man's face, hollow eyed, with long haire upon his brows. His bodie is full of haire, but not very thick, and it is of a brownish colour. He differeth not from man but in his legs, for they have no calfe. He goeth always upon his legs, and carrieth his hands clasped on the nape of his necke, when he goeth upon the ground. They sleepe in the trees, and build shelter for the raine. They feed upon the fruit that they find in the woods, and upon nuts, for they eat no kind of flesh. They cannot speak, and have no understanding more than a beast. The people of the countrie, when they travaile in the woods, make fires when they sleepe in the night: and in the morning when they are gone, Pongo will come and sit about the fire till it goeth out, for they have no understanding to lay the wood together. They goe many together and kill many negroes that travaile in the woods. Many times they fall upon elephants which come to feed where they may be, and so beat them with their clubbed fists and pieces of wood that they will runne roaring away from them. These Pongos are never taken alive, because they are so strong ten men cannot hold one of them; but they take many of their young ones with poisoned arrows. The young Pongo hangeth on its mother's belly with its hands clasped about her, so that when any of the country people kill the females, they take the young which hangs fast upon his mother. When they die amongst themselves, they cover the dead with great heaps of boughs and wood, which are commonly found in the forests."

The Pongo appears to be the Gorilla, and Battel tells much truth about it, mixed up with absurd fiction, whilst the Engeco, or as it is called by the natives of the Gaboon, the *enche-eko*, is the Chimpanzee.

Early in this century, in 1819, Bowdich says, in a description of a mission from Cape Coast Castle to Ashantee, "that the favourite and most extraordinary subject of conversation when in the

Gaboon River was the *Ingena*. This is an animal like the Orang-Utan, but much exceeding it in size, being five feet high and four feet across the shoulders. Its paw was said to be even more disproportioned in its breadth, and one blow of it is said to be fatal. It is commonly seen by the natives

MALE GORILLA.

when they travel to Kaybe, lurking in the bush to destroy passengers, not to eat them, for it feeds principally on wild honey, which abounds."

Sometimes, the natives assert, when a company of villagers are moving rapidly through the shades of the forest, they become aware of the presence of the formidable Ape by the sudden

disappearance of one of their companions, who is hoisted up into a tree, uttering, perhaps, only a short choking sob. In a few minutes he falls to the ground a strangled corpse, for the animal, watching his opportunity, has let down his huge hind-hand and seized the passing negro by the neck with a vice-like grip, and has drawn him up into the branches, dropping him when life and struggling have ceased.

The missionaries, when they were established in the Gaboon region, found that all along the coast the Gorillas were believed by the natives to be human beings, members of their own race degenerated. Some natives who had been a little civilised, and who thought a little more than the rest, did not acknowledge this relationship, but considered them as embodied spirits, the belief in the transmigration of souls

FEMALE GORILLA AND YOUNG. (From the *Transactions of the Zoological Society of London.*)

being prevalent. They said that the *enche-eko*, or Chimpanzee, has the spirit of a *coastman*, being less fierce and more intelligent than the *enge-ena*, or Gorilla, which has that of a *bushman*. The majority, however, fully believed them to be men, and seemed to be unaffected by the arguments offered to disprove this fancy; and this was especially true of the tribes in the immediate vicinity of the locality. They believed them to be literally wild men of the woods. Nevertheless, they were eaten when they could be got, and their flesh, with that of the Chimpanzee and other Monkeys, formed and still forms a prominent place in the bill of fare.

Impressed thus with a belief in their kinship and of their ferocity, it was not surprising that live Gorillas could not be obtained by European travellers. Even a bold and skilful hunter of the elephant, when pressed to bring in one, declared he would not do it for a mountain of gold.

In 1847 the first sight of a part of a Gorilla was obtained by an American missionary; it was a skull, and its shape struck him as being so extraordinary that he believed the natives were correct in attributing it to the much-talked-of Ape of whose ferocity and strength he had heard so much.

Collecting others, he at last handed them over to a fellow labourer, Dr. Savage, who possessed much anatomical knowledge. Every attempt was made to obtain even a dead Gorilla, but without satisfactory results. Savage lived for years in the neighbourhood of the Gaboon river, and not only gradually accumulated a fine collection of the bones of the great Ape, which he at first thought was the Orang-Utan, and which he subsequently described as the Gorilla, but also put together a history of its habits and aspect as gleaned from the natives. He was in the heart of Gorilla Land, which may be said to extend from ten to fifteen degrees of latitude on each side of the equator. It is bounded by the sea on the west, and extends to an unknown distance to the east, being watered by the Gaboon, Danger, and Fernandez Vas rivers. Mountainous far from the coast, and very undulating everywhere, it consists of dense forest, wild jungle, and open places. Traversed as this country is by navigable rivers which are visited by traders, it struck this observer that it was indeed remarkable that the Gorilla should have been so unknown to civilised men; but he was soon impressed with the dread the natives had of it, and also with the fact that it sought the remoter parts of the neighbouring woods. From the descriptions of the natives, who never attempted to interfere with the Gorilla except in self-defence, its height is above five feet, and it is disproportionately broad across the shoulders. It is covered with coarse black hair, which greatly resembles that of the Chimpanzee; with age it becomes grey, and this fact has given rise to the report that there are more kinds than one. Resembling a huge Ape in shape, with a great body, comparatively short legs with large hind-thumbs, its bulk is considerable, and its arms, reaching further down than in man, enable it to grasp and climb well. It does not possess a tail, and the head has a wide and long black face, a very deep cheek, great brows over the deeply-seated hazel eyes, a flat nose, and a wide mouth with very strong teeth. The top of the head has a crest of longish hair, and elsewhere it is exceedingly thick and short. The belly is very large. From inquiry he ascertained that when walking, their gait is shuffling, and the body, which is never upright like that of man, moves from side to side in going along. Usually it walks by resting the hands on the ground and then bringing the legs between them, and swinging the body forward. They live in bands, and the females generally exceed the males in number. They are exceedingly ferocious, never running away from man, and the few that have been captured were killed by elephant hunters and native traders as they came suddenly upon them whilst passing through the woods.

FRONT VIEW OF THE SKULL OF THE GORILLA.

It was said, at this time, by the natives, that the Gorilla makes a sleeping-place like a hammock, by connecting the branches of a sheltered and thickly-leaved part of a tree by means of the long, tough, slender stems of parasitic plants, and lining it with the dried broad fronds of fern, or with long grass. This hammock-like abode may be seen at different heights, from ten to forty feet from the ground, but there is never more than one such nest in a tree. They avoid the abodes of man, but are most commonly seen in the months of September, October, and November, after the negroes have gathered in their outlying rice-crops, and have returned from the "bush" to their valleys. So observed, they are described to be usually in pairs, or if more, the addition consists of a few young ones of different ages and apparently of one family. The Gorilla is not gregarious. The parents may be seen sitting on a branch resting their backs against the tree trunk munching fruit, whilst the young Gorillas are at play, leaping and swinging from branch to branch with hoots or harsh cries of boisterous mirth. This rural felicity, however, has its objectionable sides, for occasionally, if not invariably, the old male, if he be seen in quest of food, is usually armed with a short stick, which the negroes aver to be the weapon with which he attacks his chief enemy the elephant. Not that the elephant directly or intentionally injures the Gorilla, but deriving its subsistence from the same source, the Ape regards the great proboscidian as a hostile intruder. When, therefore, he sees the elephant pulling down and wrenching off the branches of a favourite tree, the Gorilla, stealing along the bough, strikes the sensitive proboscis of the elephant with a violent blow of his club, and drives off the startled giant trumpeting shrilly

with pain. In passing from one tree to another the Gorilla is said to walk semi-erect with the aid of his club, but with a waddling and awkward gait; when without a stick, he has been seen to walk as a man, with his hands clasped across the back of his head, instinctively balancing its forward position. If the Gorilla be surprised and approached, whatever the ground may be, he betakes himself on all-fours, dropping the stick, and makes his way very rapidly, with a kind of sidelong gallop, resting on the front knuckles, to the nearest tree. There he meets his pursuer, especially if his family is near and requiring his defence. No negro willingly approaches the tree in which the male Gorilla keeps guard, even with a gun. The experienced negro does not make the attack, but reserves his fire in self-defence. The enmity of the Gorilla to the whole negro race, male and female, is uniformly attested. Thus, when young men of the Gaboon tribe make excursions into the forests in quest of ivory, the enemy they most dread to meet is the Gorilla. If they have come unawares too near him with his family, he does not, like the lion, sulkily retreat, but comes rapidly to the attack, swinging down to the lower branches, and clutching at the nearest foe. The hideous aspect of the animal, with his green eyes flashing with rage, is heightened by the skin over the orbits and eyebrows being drawn rapidly backwards and forwards, with the hair erected, producing a horrible and fiendish scowl. If fired at, and not mortally hit, the Gorilla closes at once upon his assailant, and inflicts most dangerous if not deadly wounds, with his sharp and powerful tusks. The commander of a Bristol trader once saw a negro at the Gaboon frightfully mutilated from the bite of a Gorilla, from which he had recovered. Another negro exhibited to the same voyager a gun barrel bent and partly flattened by a wounded Gorilla in its death struggle.

The strength of the Gorilla is such as to make him a match for a lion, whose strength his own nearly rivals. Over the Leopard, invading the lower branches of his dwelling-place, he will gain an easier victory; and the huge canine teeth, with which only the male Gorilla is furnished, doubtless have been given to him for defending his mate and offspring.

As the appearance and some of the movements of the Gorilla are very man-like, some of the natives consider that the souls of men have entered into their bodies, and hence many apologies are made for some of their tricks and reported doings. Moreover, from this belief some of their skulls are made objects of fetish worship, and are marked with broad stripes of red paint, crossed by a white one. These were the stories told to Savage.

On returning to America, Savage investigated the parts of the skeletons he had obtained, and compared them with those of the Chimpanzee. Owen, in England, having received some corresponding specimens, continued the investigation, and all were agreed in deciding that the Gorilla was a species in itself, differing from the Chimpanzee, but sufficiently like it to be connected with it in a genus. The Gorilla was termed *Troglodytes Gorilla*, and the Chimpanzee, which will be noticed in the next chapter, kept its name of *Troglodytes niger*. The word Troglodytes was very ill chosen, and it does not refer in any way to the nature or habits of the animals. It was taken from τρωγλοδύται, the name of an Ethiopian tribe who dwell in holes or caves. The native name is Ngina.

The descriptions of the habits and anatomy of the Gorilla, fragmentary as they were, excited great interest in the minds of many travellers, and especially in that of Du Chaillu, who left America in 1855, determined to explore Gorilla Land, and to obtain some of the great Apes, dead or alive.

He first met with the Gorilla amongst some beautiful scenery, near the Sierra del Crystal, at the head waters of the Ntaubounay, a stream which runs into the Muni or Danger River. Close to some rapids down which the torrent was rushing with great velocity amongst huge boulders, and sending its spray up to the tops of the highest trees of the banks, was a deserted village, and amongst its ruins were some broken-down sugar-canes. Here and there the canes had been taken down, and torn up by the roots, and they were lying about in fragments, which had evidently been chewed. He writes:—"I knew that there were fresh tracks of the Gorilla, and joy filled my heart; they (the native hunters) now looked at each other in silence, and muttered, *Nguyla*, which is as much as to say in Nepongwe, *Ngina*, or as we say, Gorilla. We followed these traces, and presently came to the footprints of the so-long desired animal. It was the first time I had ever seen these footprints, and my sensations were indescribable. Here was I now, it seemed, on the point of meeting face to face that monster of whose ferocity, strength, and cunning, the natives had told me so much; an animal scarce known to the civilised

world, and which no white man before had hunted. My heart beat till I feared its loud pulsations would alarm the Gorilla, and my feelings were excited to a painful degree. By the tracks it was easy to know that there must have been several Gorillas in company. We prepared at once to follow them. The women were terrified, poor things, and we left them a good escort of two or three men to take care of them, and reassure them. Then the rest of us looked once more carefully at our guns, for the Gorilla gives you no time to re-load, and woe to him whom he attacks. We were armed to the teeth. My men were remarkably silent, as if they were going on an expedition of more than usual risk; for the male Gorilla is literally king of the African forest. He and the crested lion of Mount Atlas are the two fiercest and strongest beasts of the continent. The lion of South Africa cannot compare with either for strength or courage. I knew that we were about to pit ourselves against an animal which even the leopard of these mountains fears, and which perhaps has driven the lion out of his territory; for the king of beasts so numerous elsewhere in Africa is never met in the land of the Gorilla. We descended a hill, crossed a stream on a fallen log, and presently approached some huge boulders of granite. Alongside of one lay an immense dead tree, and about this we saw many evidences of the very recent presence of the Gorillas. Our approach was very cautious: we were divided into parties. We were to surround the granite block, behind which the animals were supposed to be hiding, and suddenly I was startled by a strange discordant, half-human, devilish cry, and beheld four young Gorillas running toward the deep forests. We fired, but hit nothing. Then we rushed on in pursuit, but they knew the woods better than we. Once I caught a glimpse of one of the animals again, but an intervening tree spoiled my mark, and I did not fire, but ran till we were exhausted, but in vain, and the alert beasts made their escape." As the hunters sat round their fire in the evening, before going to sleep, the adventure of the day was talked over, and of course some very tough yarns and stories were told about the Gorillas, most of which ought to have put this traveller on his guard, and impressed him that the greater part of the ferocity and the lion-like courage of the new animal were derived from the imaginations of a very superstitious and not over-courageous race of men. They were great believers in witchcraft, and they believed that many men whose names they mentioned, and who are dead, had their spirits now dwelling in Gorillas. However, Du Chaillu, a few days afterwards, started on a hunt which had a more satisfactory termination than the last. He and the rest got on the track of an old male, and suddenly as they were creeping along in silence, which made a heavy breath seem loud and distinct, the woods were at once filled with the tremendous barking roar of the Gorilla. Then the underbush swayed rapidly just a-head, and presently before them stood an immense male. He had gone through the jungle on all-fours, but when he saw the party he raised himself and looked them boldly in the face. "It stood about a dozen yards from us, and was a sight I think I never shall forget. Nearly six feet high (he proved four inches shorter), with immense body, huge chest, and great muscular arms, with fiercely glaring large deep gray eyes, and a hellish expression of face, which seemed to me like some nightmare vision; there stood before us the king of the African forest. He was not afraid of us. He stood there and beat his breast with his huge fists till it resounded like an immense bass drum, which is their mode of offering defiance; sometimes giving vent to roar after roar. The roar of the Gorilla is the most singular and awful noise heard in these African woods. It begins with a sharp bark like an angry dog, then glides into a deep bass roll, which literally and closely resembles the roll of distant thunder along the sky, for which I have sometimes been tempted to take it when I did not see the animal. His eyes began to flash fiercely, for we stood motionless on the defensive, and the crest of short hair which stands on his forehead began to twitch rapidly up and down, while his powerful fangs were shown as he again sent forth a tremendous roar. He advanced a few steps, then stopped to utter that hideous roar again; advanced again, and finally stopped when at the distance of about six yards from us, and then, just as he began another of his roars, beating his breast with rage, we fired and killed him. With a groan which had something terribly human in it, and yet was full of brutishness, he fell forward on his face. The body shook convulsively for a few minutes, the limbs moved about in a struggling way, and then all was quiet; death had done its work, and I had leisure to examine the huge body. It proved to be five feet eight inches high, and the muscular development of the arms and breast showed the immense strength it had possessed."

Du Chaillu once had a capital view of some Gorillas at their meal. News having come that

Gorillas had been recently seen in the neighbourhood of a plantation on the Fernandez Vas river, just south of the equator and not far from the West African coast, he got up early and went into it. He writes: "The plantation was a large one, and situated on very broken ground, surrounded by the virgin forest. It was a lovely morning; the sky was almost cloudless, and all around was as still as

FAMILY OF GORILLAS.

death, except the slight rustling of the tree tops moved by the gentle land breeze. When I reached the place, I had just to pick my way through the maze of tree-stumps and half-burned logs by the side of a field of cassada.

"I was going quietly along the borders of this when I heard in the grove of plantation trees towards which I was walking a great crushing noise like the breaking of trees. I immediately hid myself behind a bush, and was soon gratified with the sight of a female Gorilla; but before I had time to notice its movements, a second and third emerged from the masses of colossal foliage; at length, no less than four came in view. They were all busily engaged in tearing down the larger trees.

One of the females had a young one following her. I had an excellent opportunity of watching the movements of the impish-looking band. The shaggy hides, the protuberant abdomens, the hideous features of these strange creatures, whose forms so nearly resemble man, made up a picture like a vision in a morbid dream. In destroying a tree, they first grasped the base of the stem with one of their feet, and then with their powerful arms pulled it down, a matter of not much difficulty with so loosely-formed a stem as that of the plantain. They then set upon the juicy fruit of the tree at the bases of the leaves, and devoured it with great voracity. While eating, they made a kind of chuckling noise, expressive of contentment. Many trees they destroyed, apparently out of pure mischief. Now and then they stood still and looked around. Once or twice they seemed on the point of starting off in haste, but recovered themselves, and continued their work. Gradually they got nearer to the edge of the dark forest, and finally disappeared." On the next day he was carrying a light gun, having given his heavy double-barrelled rifle to a boy to carry, when in a deep hollow, flanked with sugar-cane, he saw on the slope opposite to him a gigantic Gorilla standing erect, and walking directly towards him. Pointing his rifle, he turned to look for the boy, but he had seen the Gorilla and bolted forthwith. The huge beast stared at Du Chaillu for about two minutes, and then without uttering any noise moved off to the shade of the forest, running nimbly on his hands and feet.

This running movement is performed principally by the arms, for the animal places the backs of its knuckles on the ground, straightens its elbows, and swings the huge body and short legs so that they come in front. Then the feet support the weight of the body until the knuckles are put on the ground in advance.

Anxious to possess some adult Gorillas, Du Chaillu offered rewards to the native hunters, and on one occasion they brought in three live ones, one being full-grown. This was a large adult female, who was bound hand and foot, and with it was her female child, screaming terribly, and the third was a vigorous young male, who was also tightly bound. The female had been ingeniously secured by the negroes to a strong stick, the wrists being bound to the upper part, and the ankles to the lower, so that she could not reach to tear the cords with her teeth. It was dark when they were brought in, and the scene was wild and strange in the extreme. "The fiendish countenances of the Calibanish trio, one of them distorted by pain, for the mother Gorilla was severely wounded, were lit up by the ruddy glare of native torches." The young male was secured by a chain, and Du Chaillu gave him the name of Tom. His feet and hands were untied, and he immediately showed his want of gratitude by rushing at his possessor, screaming with all his might; but the chain was happily made fast, and he did no harm. The old mother-Gorilla was in an unfortunate plight. She had an arm broken, and a wound in the chest, besides being dreadfully beaten about the head; she groaned and roared many times during the night, probably from pain. She lived until the next day, her moanings were more frequent in the morning, and they gradually became weaker as her life ebbed out. Her death was like that of a human being, and her child clung to her to the last, and tried to obtain milk from her breast after she was dead. The young one was kept alive for three days on goat's milk, but it died on the fourth day. The young male would not be photographed, for pointing the camera at him made the irascible little thing a small demon, but after some attempts his likeness was taken. These Gorillas were caught on a promontory which runs into the sea like a spit. A woman had seen "two sets of Gorillas on it with young ones, and the natives assembled, and armed themselves with great spears and axes, forming a line across the spit, advancing towards its extremity. They made a good deal of noise, and bewildered the Gorillas, who were shot down or beaten in their endeavours to escape. There were eight females together, but no large male." Du Chaillu, on hearing this, modified his opinion respecting the solitary habit of the animal, and he subsequently obtained proofs that they roam in bands of from five to ten. It is true, however, that when Gorillas become aged, they seem to be more solitary, and live in pairs, or as in the case of old males, quite alone. He was assured by the negroes that solitary and aged Gorillas are sometimes seen almost white, for the hair becomes grizzled with age. Evidently the animal migrates here and there in his restricted district during certain seasons, and they search for a little yellow berry called "rubino," which grows on a tree resembling the African teak; and also two other fruits, one like the nectarine in size, and of the colour of the peach, but not having the rich bloom, and the other like a plum. The same traveller came suddenly on a band of Gorillas in a forest; "a whole group was on a tree hidden by the

dense foliage. They bolted off, making the thinner boughs bend with their weight, and an old male, apparently the guardian of the flock, made a bold stand, and stared at him through an opening. As soon as voices were heard, the shaggy Ape roared a cry of alarm, scrambled to the ground through the entangled lianas that were around the tree trunk, and soon disappeared into the jungle."

Having had, then, so many opportunities of seeing Gorillas alive and dead, Du Chaillu, of course, added largely to the knowledge of their general shape and habits, and obtained skins for stuffing, and bones for the anatomists. Five specimens were sent over by him to England, and great discussions took place; some naturalists asserting that the ferocity and courage of the great Ape were imaginary, and others believing in the truth of Du Chaillu, whose only fault was over-sensational writing, and who strenuously denied many of the native stories. Then the anatomists had a great quarrel about the brain of the creature, and handled each other very severely. Of the nature of the outside of the Gorilla there could be no doubt, fortunately, for there are the stuffed skins and bones to be seen, and an examination of those in the national collection will prove how closely Savage must have questioned the natives who gave him reliable information, and how little can be added to his description. Du Chaillu says that in length the adult Gorillas vary as much as men, and believes that the tallest are six feet two inches in height, but that the average is from five feet two inches to five feet eight inches. The females are smaller, or have a lighter frame, their height averaging about four feet six inches. The colour of the skin in the Gorilla, young as well as adult, is intense black, so far as the face, breast, and palms of the hands are concerned. The fur of a grown, but not aged specimen, is iron-gray, and the individual hairs are ringed with alternate stripes of black and gray. It is long on the arms, and slopes downwards from the shoulder to the elbow, and upwards from the wrist to it. The head is covered with reddish-brown hair, which is short, and reaches the short neck. The chest is bare in the adults, and thinly covered with hair in young males. In the female the breast is bare, and the hair elsewhere is black with a red tinge, but it is not ringed as in the male; moreover, the reddish crown which covers the scalp of the male is not apparent in the female till she has almost become full grown. The eyes are deeply sunken: the immense overhanging long ridge giving the face the expression of a constant savage scowl. The mouth is wide, and the lips are sharply cut, exhibiting no red on the edges, as in the human face. The jaws are of tremendous weight and power. The huge eye-teeth or canines, of the male, which are fully exhibited when, in his rage, he draws back his lips and shows the red colour of the inside of his mouth, lend additional ferocity to his aspect. In the female these teeth are smaller. The almost total absence of neck, which gives the head the appearance of being set into the shoulders, is due to the backward position of the joints which fix the head to the spine, and this allows the chin to hang over the top of the front of the chest. The brain-case is low and compressed, and its lofty top ridge causes the profile of the skull to describe an almost straight line from the back part, or occiput, to the ridge over the brow. The immense development of the muscles, which arise from this ridge, and the corresponding size of the jaw, are evidences of the great strength of the animal. The eyebrows are thin, but not well-defined, and are almost lost in the hair of the scalp. The eyelashes are thin also. The eyes are wide apart; and the ears, which are on a line with them, are smaller than those of man, but very much like his. In a front view of the face the nose is flat, but somewhat prominent—more so than in any other Ape; this is on account of a slightly projecting nose-bone, very unusual in Apes. The chest is of great capacity; the shoulders being exceedingly broad. The abdomen is of immense size, very prominent, and rounded at the sides. The front limbs have a

FACE OF THE GORILLA.

prodigious muscular development, and are very long, extending nearly as low as the knees. The fore-arm is nearly of uniform size from the wrist to the elbow, and, indeed, the great length of the arms, and the shortness of the legs, form one of the chief differences between it and man. The arms are not long when compared with the trunk, but they are so in comparison with the legs. These are short, and decrease in size from below the knee to the ankle, having no calf. The hands, especially in the male, are of immense size, strong-boned, and thick; the fingers are short and large, the circumference of the middle finger at the first joint being five and a half inches in some Gorillas. The skin on the back of the fingers, near the middle, is callous, and very thick, which shows that the most usual mode of progression of the animal is on all-fours, and resting on the knuckles. The thumb is short, and not half so thick as the forefinger; and the hand is hairy as far as the division of the fingers, which are covered with short thin hairs. The palm of the hand is naked, callous, and intensely black. The nails are black, and shaped like those of man, but are smaller in proportion, and

PALM OF THE FOOT OF YOUNG GORILLA.

BACK OF THE HAND OF YOUNG GORILLA.

(From the *Transactions of the Zoological Society of London.*)

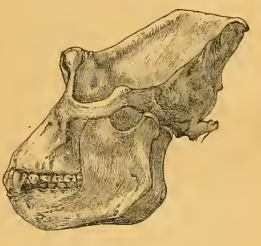
project very slightly beyond the ends of the fingers. They are thick and strong, and always seem much worn. The hand of the Gorilla is almost as wide as it is long, and in this it approaches nearer to that of man than any of the other Apes. The foot is proportionally wider than in man; the sole is callous, and intensely black, and looks somewhat like a giant hand of immense power and grasp. The transverse wrinkles show the frequency and freedom of movement of the two joints of the great toe-thumb, proving that they have a power of grasp. The middle toe, or third, is longer than the second and fourth, and this is unlike the foot in man. The toes are divided into three groups, so to speak; inside the great toe, outside the little toe, and the three others partly united by a web. Du Chaillu thinks that in no other animal is the foot so well adapted for the maintenance of the erect position, and he erroneously believed that the Gorilla is much less of a tree-climber than any other Ape. The foot in the Gorilla is certainly longer than the hand, as in man. These descriptions are fairly correct, but it is necessary to examine the results of the later writers on the subject, from whom we may glean the following facts.

The Gorilla has a large head, and on looking at a stuffed specimen one is at once struck with the width and length of the face, and the great prominent brows immediately over the eyes. There appears to be no forehead, for the head recedes rapidly backwards, and then comes a high ridge of hair, in old males, running from before backwards on the top of the scalp, and meeting

another which is less prominent, and placed across the back of the skull, from the back of one ear to that of the other. The animal has the power of moving the flesh and skin which constitute the scalp freely forwards and backwards, so that when it is in a rage its scowl is made all the more threatening and ugly by its frowning and bringing down the hairy ridge close to above the eyes. The hazel eyes are large, and they are separated by a small prominent bridge belonging to the nose, the rest of which is broad and flattened out. The jaws project forwards, and are long and wide, the teeth being large and strong, and visible when uncovered by the fleshy and rather hairy lips. The ears are small for the size of the head, when they are compared with those of other Apes, and they as well as the skin of the face are naked and dark.

Nature has been kinder to the females so far as beauty is concerned, for they have less marked crests of hair, smaller brows, and shorter side teeth, and therefore more amiable faces under all circumstances.

Of course the outside appearance of the head has much to do with the skull beneath, and this has been very carefully studied by anatomists. As a whole, the skull of a full-grown male Gorilla is larger than that of a man, but it is lighter, although it appears to be more massive on account of its being marked by great bony ridges or crests, which correspond with the lines of hair on the top and back of the head, one being on the top like the crest of a helmet, and the other crossing the back and reaching the other so as to form a rude T shape. Careful measurement proves the great size of the Gorilla's skull as a whole, and that this is dependent mainly on the dimensions of the bones of the face, the cavity for the brain being smaller than that of man. But it does not appear at first very easy to explain how it is that this massive-looking skull should be lighter than that of man. A careful examination of the bones of the Gorilla's skull explains the difficulty, and in a very interesting manner.



SIDE VIEW OF THE SKULL OF GORILLA.

The massive and solid look is given to it by the crests or ridges beneath the hair already mentioned; they are of great use, for they give attachment to very powerful muscles, especially to those which move the lower jaw, and enable the teeth to bite forcibly. The surface of the bones of the head for a certain depth is solid enough, but below this solid layer there is a cellular arrangement consisting of a network of bone, with cavities communicating with each other with the internal parts of the ears and nose. Below this is solid bone again. So that there are three layers, and the central one gives lightness and strength to the whole; moreover, it protects the brain under the skull from receiving shocks during falls or blows by boughs.

When the skull receives a sharp blow, for instance, in front or behind, or low down at the sides, the outer layer of solid bone is often cracked, and even forced in. If there were no cellular layer, the tender brain would be injured directly, but the network of bone and the large spaces amongst it take off the jar from that important organ, and suffer the outer layer to be pressed in without affecting the deeper structures. It must be a very hard blow that can press the cellular layer in sufficiently to break through the third layer, which is solid but thin. Very possibly the larger air spaces of the cellular layer assist the senses of hearing and of smelling also.

There is another very strong bone connected with the skull, which feels like a ridge, passing backward from the eye to the ear; and it has something to do with the other ridges, for the muscles which are attached to them, and which pass down to the lower jaw to give it great power of mastication, are covered on the cheek by it. This cheek-bone forms a kind of arch, and gives the great breadth to the upper part of the face of the animal.

In a front view of the skull of the male Gorilla the ridge or crest on the top of the head stands up like a little peak; then over the eyes is the great brow ridge, which seems to press the upper part of the cavity for the eye (the orbit) flat, so that it is not round as in most animals, but rather square in outline. These three sets of ridges, those of the upper and back part of the brain case, that of the

brow and those of the cheeks, so large and important, are distinctive of the adult male animal, and a skull possessing them belongs to the Gorilla and to no other animal.

The females and the young of both sexes have not the top ridges, and the others are small in comparison with those of the male adults.

Clearly the ridges give strength to the head, muscular power to the jaws, and what is of great importance to a large active animal, do not interfere with the lightness of the strong skull.

The skull is hollow beneath the top and back ridges, and this space is occupied by the brain and its investing membranes, and the nerves coming from it, to supply the muscles of the face and head, the skin over them, and the organs of special sense, such as the eye, the ear, and the nose. The space is considerable, and for an Ape the Gorilla has a large brain. He has a large body, very many muscles capable of complicated movement, and he can see, hear, and smell admirably; and as the nerves which supply the necessary energy for all this come from the great nervous centre, as the brain is called, it must be of considerable size and complexity. Moreover, as many of the motions and sensations of the Ape resemble those of man, the brains of both will resemble each other to a certain extent. But all that part of the brain which serves in a manner, as yet past our comprehension, to assist the production of the high intelligence and moral powers of man, we should expect not to find in the purely sensual animal, and the expectation is realised. Again, although bone for bone, muscle for muscle, and blood-vessel for blood-vessel, those of the great Ape and man may be compared with wonderful exactitude; still man in relation to the Gorilla has a greater power of elegance of movement, and of producing complicated muscular efforts, and of employing many different muscles to produce a common end, and therefore his nervous system must be all the more perfect. Thus, the Ape cannot imitate the graceful actions which sway the body as when a well-made man walks leisurely, and it cannot get all the muscles of the mouth, tongue, and larynx (or organ of voice) to act simultaneously and orderly, so as to produce the sound of articulate voice. Yet these actions are performed by man without any special effort; they may be done without thinking, and are mechanical, as it were, or more properly, "automatic," done as if by a machine; they require a very perfect arrangement of the nervous system, and an unusual amount of nervous matter.

No amount of schooling, could it be given, would ever make a Gorilla entertain the notion of insuring its life; arithmetic is impossible; the fine arts and poetry are unattainable, and therefore by so much is its brain the smaller and simpler.

The brain case, or the space enclosed by the crested skull bones, is compactly filled with the nervous material in all animals, so it is only necessary to ascertain the relative dimensions of the spaces in different animals to get a notion of the difference in the sizes of their brains. The space can be measured by filling it with sand, and then measuring its bulk in a proper measure.

Some Gorillas have larger spaces for the brain than others, and in this they resemble man, for there is a considerable difference between the capacity or the size of the space in a well-educated European and a savage Australian. And, doubtless, some Gorillas are cleverer than others, or are more active, generally speaking, so have larger brains; but an average may be taken of the different sizes in them as in man, and the results come out as follows:—

The average or mean size or capacity of the brain case in the Gorilla is about 31 cubic inches, a cubic inch being a six-sided space of one inch long, broad, and high. In man, the European may have a brain case holding 114 cubic inches, and the Australian only 63 cubic inches; the mean of the European size is 93 cubic inches, that of the Australian being 75. Hence the brain case, and therefore the mass of the substance of the brain of the Gorilla, is not one-half that of the lowest race of man.

Only the brains of young Gorillas have been examined, and these have not been in a very satisfactory state; but enough has been gleaned from their study to determine that they are not so high, wide, or long, relatively, as those of mankind. The brain of man is a wonderfully complex structure, and the nervous matter is folded and packed in many ways or "convolutions," and the nerves arise from special parts which are connected by cross and long fibres or "commissures." All these structures exist, but not in perfection, in the Gorilla's brain; and although the nerves are large, that portion of the brain which originates their energy and action is much smaller than in man.

Apparently the brain grows to a certain age in the Gorilla, and then the skull increases in outward size, and the creature has a huge body, with mental capacities far below those of a child or man.

The ridges and crests on the top and back of the Gorilla's skull are larger than those of any of the great flesh-eating animals of the cat tribe, and it has therefore been thought that they were a proof of the occasional bad habits of the great Ape, and of his indulging now and then in negro flesh. Large as are the crests in the old males, they are barely present in the females and young, and they must be regarded partly as of use to the larger animals, and partly as ornamental; for in animal nature, as a rule, the gentlemen are more beautiful than the ladies, the idea of beauty being, of course, very much a matter of taste. They are evidently protections against falls, and they also give origin to muscles. The back crest, when looked at from behind, is almost fan-shaped, the bone being broad, and the great muscles of the neck and back are attached to it. They pull the head backwards, and the single, long crest on the top gives origin to the muscles, which pass downwards on the temples to the lower jaw. Indeed, the energy of the muscles of the side of the head is principally devoted to the lower jaw, to its crushing, crunching, and masticating offices, for the food, although often soft enough, is occasionally inside the sugar-cane, and several harder woods. The powerful upper jaw is, of course, attached to an equally strong lower one, which forms the front and lower part of the face. The upper jaw reaches out far in front of the eyes and nostrils, and is straight rather than bulged, and appears narrow, from side to side, in comparison with the great, wide cheek-bones, but it looks formidable with four strong front teeth, projecting only slightly, and a large, long, eye tooth on each side, sticking out rather far below the others.

On looking at the under surface of the roof of the mouth and palate, the cause of the length of the front of the face is seen. Instead of the back teeth forming an open curve around the roof of the mouth, as in men, they are placed in a long, and almost parallel straight row. Five great teeth on each side thus form with the bone, into which their fangs are planted, a long side to the face. In front of these is the large eye, or dog tooth (canine tooth), mentioned above.

The palate and roof of the mouth are long and comparatively narrow, and hence no Gorilla could speak distinctly, or use his tongue glibly enough to talk as a child. Howling and a kind of bark may, on the contrary, be done to perfection.

But although of no use as regards speech, the long roof of the mouth, with its wide ranges of teeth, is of great importance to a vegetable-eating creature, which does not want the sugary juices of its food to run out of the corners of its mouth, and which spends the greater part of its time in filling its capacious stomach. * The lower jaw fits the upper one, and when its teeth clench with those above, the cavity of the mouth is nearly shut, and it is quite closed by the lips and cheeks outside.

As might be expected from the great muscles which unite the lower jaw to the skull, it is large and strong, but it has no projecting chin, and this slopes in a retiring manner. The side of the jaw which supports the teeth is, as in man, curved upwards behind at what is called the angle. The jaw is very movable, and can act sideways in munching, or up and down, as in biting; and having these powers—thanks to the action of different sets of muscles—it has teeth fashioned to bite, and to crunch, and to chew. They greatly resemble those of the upper jaw, on which they work, and a superficial view of them all leads to the opinion that they greatly resemble those of man; there are, however, many differences. As in the upper jaw, the front and eye teeth are nearly straight in front, the last-mentioned projecting outwards, and the front teeth biting inside the upper ones; and the back teeth are in straight rows also.

The following story is told by Du Chaillu to illustrate the cause of the wearing of the front teeth of the Gorillas. He had gone into the interior, and was suffering from hunger, so went out into the forest for game. Not finding any, he was about to retrace his steps, when he heard the unmistakable roar of a Gorilla. He writes, "I plunged forward into the thick of the forest, breaking, as I went along, small boughs to enable me to find my way back, and tearing my clothes in the thorny underwood. The roar became nearer, and seemed to shake the ground under me. I heard the rustling of the branches, and fancied there must be more than one. The excitement of the moment was great, and was increased by the prospect of obtaining food for all our party.

* The back edge of the hard, bony palate, with which the soft palate and uvula are continuous, forms a wide concave notch, whilst that of man projects in the centre of the notch.

Suddenly the roaring ceased. I stopped, thinking that it was a male, which was preparing to advance on me. But I listened in vain—the beast had fled. When I reached the spot I saw nothing but broken branches of trees. I measured some of them with my thumb, and found boughs of five inches' diameter broken in two by the powerful grip of this monster of the forest. Although disappointed in my chase, I was glad to find a corroboration of the explanation I had given of the wearing down of the animal's front teeth, for some of the branches plainly bore the tooth-marks."

As the teeth of the Gorilla are admirably adapted for their duties of masticating and biting vegetable food, sometimes soft and sometimes hard, and as they resemble in number and general arrangement those of man, it is necessary to notice them briefly. They are of three kinds, the front ones, which bite when the jaw is moved up and down, the large eye teeth (or dog teeth), which pierce, and the back teeth, which crush and grind. The first-mentioned are called incisor teeth or cutters, and there are four in the upper and four in the lower jaw, as in man; the inner two in each jaw being

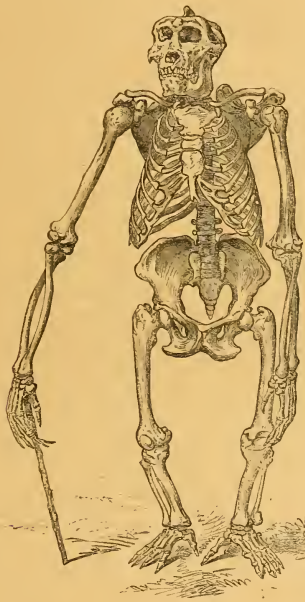
UPPER JAW. PALATE. UNDER JAW.

THE TEETH OF THE GORILLA.

larger than the outer two. They project slightly, and those of the upper jaw cut on the lower ones, and are, when the jaws are clenched, in front or "over-hung." In shape they are adapted for biting a piece out of anything, and they have one fang each, which fits into a socket in the jaw. In the upper jaw there is a space between the incisor teeth and the great eye or dog teeth. This is one of the matters which distinguish the jaw of the Gorilla from that of man, whose teeth are continued in a row without any spaces where the gum is visible between them. The cause of the space is that the lower eye tooth is so large and long that when the mouth is closed it fits in there. This space is called a "diastema," and, as it is a term which will often be mentioned, it is necessary to notice that it is taken from the Greek word διάστημα, "an interval." In the lower jaw the incisor teeth are succeeded by the eye teeth without any diastema. The eye or dog teeth are usually called canines, from *Canis*, a dog, they being very distinct in that animal. They are four in number, two being in each jaw, one on each side, and those of the upper jaw are long and pointed, being rounded, moreover, outside, and marked by grooves inside. The lower canines are nearly as large as the upper ones, and, as already noticed, fit in the diastema in front of those of the upper jaw.

Behind the canine teeth are, on each side in both jaws, five crushing teeth, that is to say, ten in each jaw, and twenty in all. In the upper jaw there is a continuous row of teeth from the canines in front to the last of the crushers, which occupy the position of the upper wisdom teeth of man, but in the lower jaw there is not this serried row of teeth, for, between the crushing ones and the canine, there is another space or diastema into which the upper canine tooth fits when the mouth is closed.

All these hind teeth are made to endure constant grinding, one over the other, in masticating, besides frequent shocks—as when nuts are cracked—and to last for years. Covered with a beautiful enamel, which gives them strength and smoothness, they are safely fixed by fangs in sockets in the bone, in such a manner that the nerves and blood-vessels supplying them do not suffer from pressure. They are not quite flat at the top, for then they could not grind, and they are not acutely sharp-pointed, for then the points would prevent the side-to-side movement of the jaw, and would be broken off; but they have rounded projections, or cusps, on them, separated by grooves, so that those of



SKELETON OF THE GORILLA.

the teeth of one jaw can fit into those of the other. All these teeth are not quite alike, and they are divisible into two kinds, the three hinder ones being the molar teeth, from *Mola*, a mill-stone, and the two in front of them being called false molars or pre-molars (front molars). Every one who has had a back tooth (a molar) taken out, will remember its three fangs, and in a Gorilla there would be the same terrible wrench in extracting a molar for the same reasons as with us. But, fortunately for it, tooth decay is unknown, and the molars, with their three fangs, last as long as life. The pre-molars have two fangs only in man, but it appears that sometimes there are three to those teeth in the upper jaw of the Gorilla, and two only in the lower. They are smaller than the true molars or three back teeth, and in front of them; and that nearest the canine tooth is often tall, and almost like a four-sided

pyramid in shape. The size of the crushing or molar teeth is very distinctive of the Gorilla when it is compared with the other great man-like Apes, for the upper ones are equal in size, and in the lower jaw the hindmost tooth is larger than the others. Moreover, these lower teeth have five cusps or projections. There is a ridge extending obliquely across the crowns of the lower molars from an inner to an outer cusp; and the cross-like grooves of the upper surface of the corresponding teeth in man are not seen. The manner in which the teeth of the Gorilla differ from those of other Apes will be mentioned in the several descriptions. Milk teeth, or those of the first set, are found in baby and young Gorillas, and when they fall out the permanent set come out of the jaw and replace them, adding also to their numbers. The long canine teeth are characteristic of the old males, and those of the females and young are much smaller. The thirty-two teeth of the Gorilla, eminently adapted for a mixed vegetable diet, are therefore arranged as follows:—Upper jaw—four incisors, two canines, four pre-molars, and six true molars, and there is the same number in the lower jaw.

It is a very remarkable fact, and one which will be of some interest in comparing one of the other great Apes with the Gorilla, that the skull of the young Gorilla (of both sexes) and that of the full-grown female differs materially from that of the male in the absence of the prominent ridges of the top and back of the head. This gives a roundness to their skulls which would at first sight lead to the belief that they could not belong to the same species.

Living upon such nice things as sugar-canes and pine-apples, the Gorilla has a long and well-formed tongue to taste them with,* and a good nose to enjoy their scent and fragrance. The nostrils are open, and look downwards, being separated by a moderately wide piece of flesh covering, gristle, or cartilage, and they are protected above by very dense bones, which form the slight ridges called the nasal bones. Up the nose a passage leads to the air spaces in the bone of the front of the head, and they and some curiously curled bones not very far from the nostrils are covered with a delicate membrane well supplied with the nerves in which the function of smell exists.

Both the natives and Du Chaillu allude to the roaring and yelling of the old male Gorillas, and it will be noticed further on that the young ones can make noise enough. Dr. Savage was told that when the male is first seen he gives a terrific yell that resounds far and near through the forest, something like *Kh—ah! Kh—ah*, prolonged and shrill, and others have compared the noise to distant thunder. They have an organ of voice on the top of the windpipe, made on the plan of that of man, but deficient in many respects, and especially in those fine adaptations of structure which produce the human voice. But there is a very remarkable arrangement in their larynx, as it is called, which, although it has nothing to do with the formation of sound, may possibly make it more resonant and growling, and this is one of the things which separate the great Ape from man in matters of mere construction.

THROAT OF GORILLA.

At the back of our tongues, and also of those of the Gorilla, is a little flap, rather hard and gristly in us, and only membranous and soft in the Ape, which covers over the top of the air-passage into the windpipe when any food is swallowed. The food or drink would otherwise get into the air-passage, and would be constantly going "the wrong way." Immediately under this flap, or, as it is called, the epiglottis, is a space limited in front by the hard substance we call in our throat the "Adam's apple," and at the bottom of it are the movable structures by whose action voice is produced. Now, in the Gorilla, this space is not shut in front as it is in us, but there are two openings in it, one on either side, which lead to a complicated sac or pouch. This pouch is made of thin membrane, and covers, when blown out like a bag—for the air coming out of the windpipe can be forced in—the front of the windpipe, and projects sideways under the muscles of the throat, and even amidst those of the armpits. The Gorilla can thus blow his neck out, as it were, and when he is yelling, the air in the bag

* The tongue has the same kind of papillæ, or slight projections of its surface, as in man; some called fungiform are seen at the tip, and on the surface generally, and others more or less cup-shaped. These last are found at the back, and are not arranged in any definite shape or order.

or pouch must resound. Possibly this great bag of air may have something to do with making the body lighter when the animal is climbing and using all the force it can with its arms. These so-called "laryngeal" pouches are found in many Apes and Monkeys, but their double opening into the space below the little flap is peculiar to the great Apes, which are sufficiently man-like as to be called by the term Anthropoid—the Gorillas, their allies the Chimpanzees, the Orangs, and the Siamangs.* All the other Monkeys of the Old World with sacs have but one opening into a space, or, as it is termed, the ventricle of the organ of voice, or larynx. The Monkeys of the New World have a different arrangement of air pouches, which will be noticed in the proper place.

The Gorilla has one little peculiarity which distinguishes it from all other Apes and Monkeys, and which causes it to be more like man, and insignificant as it may seem, it is of some interest. In man there is a decided projection of bone behind, or rather below the ear, and this is called the teat-shaped process of the ear-bone (Mastoid process), and is of importance to the organ of hearing and also to the muscles which steady and keep the head erect, and allow of its being moved in particular directions. This process exists to a certain extent in the Gorilla but not in the Chimpanzee, Orang-Utan, or in any other of the Quadrumana. It is smaller in the Gorilla than in man, but it is made up, as in us, of a number of spaces enclosed by bones which have to do with the organ of hearing in some way or other, and which are lined with membrane. On the outside a muscle is attached, which passes downwards and inwards to the top of the breast-bone, covering the great blood-vessels and nerves of the neck.

In examining this process of bone, attention is of course drawn to the ear itself, and there is no doubt of the remarkable resemblance of those of man and of the Gorilla. The great Ape has evidently a very quick sense of hearing, for it gets out of the way of men as quickly as is possible, when it can only hear them in the forest and jungle, but that it should have the outside ear fashioned nearly after the resemblance of that beautiful structure in man is very remarkable. The ear of the Gorilla is smaller in proportion to the size of the head than those of other Apes, and is about the same length, but broader than that of man; the lobe, which is perforated by us for earrings, is perhaps less perfect in the Gorilla, but all the curves and folds, which are so complicated yet so graceful in the human ear exist in it, modified more or less, and not so harmonious in their general symmetry, as in man.

With all its great strength, the head of the great Ape cannot move as readily on the neck as that of weaker man, for the skull is not placed on the neck end of the back-bone quite in the same manner, and its position is not that which is admirably (as in us) adapted for carrying the head erect. One of the greatest marvels in the structure of man is the manner in which the tender mass of nerves called the spinal cord or marrow passes out of the hard skull into a bony canal down the spine, and yet does not suffer injury as head and back move and roll about.

The spinal cord or marrow passes out of the skull through a special opening, on the outside of which is a joint on either side. These joints fit on to corresponding ones on a ring-shaped bone (atlas bone), and this bone rests on one equally hollow, and which has an upward projection which enters the ring (axis bone), and is clasped to it by a strong ligament. It is this projection which prevents the spinal marrow from being injured by the head moving too freely, and yet life hangs almost on a thread, for were this strong ligament to break the soft nerve would be pressed in by the bony projection, and death would ensue. All the motions of the head are connected with these bones and their joints, and the way in which it is carried is in relation with the position of the opening in the skull for the spinal marrow. If the head is to be carried erect, as in man and in many birds, the opening is far from the back part of the head. If the face is to look upwards, as it does in a pig or dog, the opening is very far backwards. In the Gorilla it is not quite at the back, but further in that direction than in man, and hence the face of this Ape is more liable to be looking upwards than forwards. This is really the case, for the natural position of the animal is not erect, but on all-fours, and then it wants to look, not on the ground, but upwards and forwards, by tilting the head. Many of the great muscles of the back crest have to do with this. It is noticed also that the joint which permits the head to move on the ring-shaped bone (the atlas bone) is not so long or curved as in man, and therefore the movements of the Gorilla's head are restricted.

* The Gibbons have no air sacs.

All accounts of the life of a Gorilla tell of its moving rapidly amongst trees, climbing readily and noiselessly, and gathering its food constantly. It is therefore necessary to examine into the manner in which this is done, and how it relates to the shape and anatomy of the creature.

In climbing trees, the Gorilla, like a man under the same circumstances, lifts up the arms over the head, and clasps or holds on with one hand, but the position of the hand is not the same. Apes seize instinctively with the knuckles towards them, and not with the ends of the fingers and palm as man: and this makes a great difference, for the muscles of the back are therefore more important to the Ape than those of the chest in climbing. Then with some muscular effort the body is lifted or rather drawn up, so that the unemployed hand can reach and clasp higher than the other; and having thus two hands holding on to a bough or a tree, the muscles of both arms are used to draw up the ponderous trunk, head, and limbs until the face comes more or less on a level with the wrists. When this is accomplished, one of the arms is suddenly forced upwards to enable the huge grasp of the fingers to tighten upon a higher fixed point, and the "hand-over-hand" process is continued as long as is

FOREST IN THE GABOON COUNTRY—THE LAND OF THE GORILLA.

necessary. Doubtless the clasping feet assist in this movement, which is only rarely performed by man, but which is one of the commonest with the great Ape. A sailor or an acrobat may often use the muscles which are required to perform this feat of carrying upwards the body with the aid of the arms, but ordinary people rarely employ their energies in this manner; the Gorilla, on the contrary, must climb often and for some distance every day of its life, both for food, amusement, and for shelter. It becomes, therefore, an interesting question whether the Gorilla has any special muscles or bones which enable it to climb easily and rapidly, and for a considerable time, or whether there are the same kinds of bones and muscles in its hands, arms, and shoulders, which are to be found in man modified more or less. The results of careful inspection have proved that, although there are no peculiar structures given to the great Ape wherewith it may climb, still the bones of the arms and shoulders, and the muscles which are attached to them, greatly as they resemble those of man, are larger and stronger. Bone for bone, and almost muscle for muscle, the climbing limbs of the man and the Gorilla may be compared with extraordinary exactness; the structures of the last-mentioned being, as it were, simple exaggerations of the former, and the increased size bearing a distinct relation to the agility and energy displayed. It must be remembered, however, that whilst in man the muscles of the chest assist principally in climbing, in the Ape those of the back and shoulders are the most important.

It is hardly necessary to notice the relation which bones and muscles have to movement, and the

most unlearned in anatomy need only be reminded that muscles are adherent to certain parts of bones. The bone, by itself, is motionless, and the force which can move it, and with it, the surrounding flesh and skin, acts through the muscles, and these consist of vast numbers of long microscopic fibrils, placed side by side, and adherent, at both ends, to different bones. The fibrils have a vast amount of energy in them, and they can contract, or, in other words, shorten; the diminution in length being accompanied by a display of force. As the fibrils shorten, they tend to bring the motionless bones closer together, and to impart motion, which may be rapid, and more or less forcible. If one bone is stationary, the other may be brought towards it by the muscular contraction, or if both are not fixed, both may move. The nervous force produces the muscular contraction, whose vigour and lasting power depend a great deal upon the supply of blood sent to the fibrils through the blood vessels (arteries), and removed through the veins.

In the principal act of climbing hand-over-hand, a bough or some stationary object is grasped by the fingers, the arm being straight, and the body hanging, as it were, to it. The first motion is the lifting up of the arm; the second is the grasping with the hand; and the third is the bending of the straight elbow, and bringing the shoulder up nearer the fixed point, or the part grasped. Whilst

BONES OF THE FORE-ARM AND ARM OF THE GORILLA—SIDE VIEW.

SHOULDER OR BLADE-BONE.

this is being done the body is not limp, but more or less stiffened by the spine, which runs down the back, and consists of many bones, being made rigid by the contraction of many small muscles. Now the bones and muscles of all the parts of the body engaged in climbing are so arranged that the spine shall not suffer any jarring, but shall be lifted up safely. Were all the muscles which pull upon the arms attached to it, every unusual effort would drag it almost to pieces, so there is a wide flat bone placed between the spine and the arm. This so-called blade-bone is jointed by a ball and socket joint to the arm-bone, but is only united to the spine and back part of the head by muscles. Muscles start from the spine to the blade-bone, from the blade-bone to the bones of the arm and fore-arm, and from these last to the bones of the fingers, and by their shortening or contraction, the fingers being stationary, the body is at last brought closer to them.

In order to explain the first motions of climbing, it is necessary to remark that on looking at the skeleton of the Gorilla the shoulder-blades are seen to be of the same general shape as those of man; they are much larger, however, and there are some anatomical points about them, which clearly have to do with the ability of the great Ape to keep its arms up for a long time, and to pull up its heavy body when the hands and fore-arms are fixed and immovable by clasping. One muscle, which in ourselves forms the cushion on the shoulder, and reaches down the outside of the arm for a little distance, is called the deltoid or Δ-shaped muscle, and its especial duty is, when the shoulder-blade is fixed, to lift up the arm by its contraction. The movement is permitted because between the spots where the muscles are adherent to the blade-bone on the one hand, and to the outside of the arm-bone on the other, a distance of several inches, there is a joint like a ball and socket. The muscle is not

attached to a flat surface on the blade-bone, but to a raised edge, which runs rather obliquely, and is called the spine of the bone. Now this muscle is of immense importance to the Gorilla, as may be imagined from the nature of its function or office: it is placed in the same position as in man, and between the same kind of bones, but the spine of the blade-bone is longer, broader, and more slantingly set in the Ape, so that extra strength and greater power are attained.

This spine, or rather raised ridge, can be felt when we place the right hand over the left shoulder as far as possible, keeping the fingers between the neck and the end of the shoulder, and its slanting position can be traced best in the Gorilla; and it may be mentioned, that in the Chimpanzee the direction is much more oblique. Above this spine of the blade-bone there is the upper part of the blade, and it is covered with muscle, the space thus occupied being much larger in the Gorilla than in man. This muscle starts from this bone, to which it is attached, and is united to the arm-bone, close to its joint with the blade-bone; it is larger in the Gorilla than in us, and one of its uses is to assist the deltoid just mentioned.

There is rather an interesting arrangement in the old Gorillas, which is not found in the young or in man, and which appears to have to do with the power of this muscle and its prolonged action. The muscle is well supplied with blood, and the nerve which endows it with energy is particularly well prevented from being compressed during the movements of the muscles amongst which it runs, any compression being very injurious. The upper edge of the blade-bone is notched, and a dense tissue or ligament stretches from one point of the notch to the opposite one, enclosing a small open space; now the nerve runs through this space, and is protected by the hard tissues of bone and ligament from the contraction of the soft muscles. In the old Gorilla a further protection is found in the presence of a little projection of bone in this space, which acts as a greater preventer of pressure.

After passing through this space the nerve enters the very substance of the muscle, and is distributed to its fibrils.

The upper arm reaches down from the shoulder to the hips in the Gorilla, and its bone (*os humerus*, from the Latin) is strongly marked on its surface by roughnesses and ridges, to which the great muscles are attached. In man the shape of the upper arm varies with the strength of the individual, but in the strongest man and in the most beautifully-shaped woman it has a swelling on the front, and tapers more or less towards the elbow. This is caused by the two-headed or biceps muscle, and by other muscles ending in tendons. But the Gorilla has a very shapeless upper arm; it is, as it were, fat and round throughout, and very large above the elbow, and this is because of the size of the bone within, and on account of the muscles not tapering as they do in man, but being well developed right down to their ends. Hence, elegance of shape is sacrificed to extra muscular strength and size of bone.

On looking at the arm-bone, which, being connected to the shoulder by a joint, has much to do with the act of climbing and striking, it will be noticed that it greatly resembles that of man in shape, but is longer, stouter, and clumsier. The joint is nearly in the shape of a rounded knob, and the corresponding depression or cup on the blade or shoulder-bone into which it fits, is an oval and concave surface, and they are kept close together by a kind of capsule which stretches from one bone to the other and encloses the joint. Perfect freedom of movement is insured by the bones being covered with glistening cartilages, and a delicate and moist membrane, and the motion from the shape of the apparatus is almost equal to that of a chandelier where there is what is called a cup-and-ball joint at the ceiling. It has already been noticed that muscles are attached to the blade-bone and to the arm-bone below the joint, and that, this being movable, when they contract they move the arm, and the instance was given of the action of the deltoid muscle in raising the arm. In the Gorilla, this great muscle reaches lower down than in man, and there is a very strong mark in the shaft of the bone for its insertion. This gives the muscle greater play than in us, and enables it to lift, more slowly perhaps, but more efficiently, for the arm-bone between the joint and the place where the muscle is attached, is the long arm of a lever which is shorter in man. Below the globular head of the arm-bone is the shaft or cylindrical part of the bone which gives origin to the three-headed muscle called triceps, and is covered by the two-headed one (biceps) already mentioned, besides the deltoid. A deep groove allows one of the ends or heads of the biceps to pass along and slide over the joint and to reach the shoulder-blade. The shaft as a whole is more or less cylindrical, with a slight angular outline, the angles being projections of

bone which strengthen the whole, besides giving attachment to muscles; the cylindrical shape is the best for strength and lightness, and these properties are increased by the adoption of a plan which engineers have long since unwittingly copied. The shaft is hollow, and is cellular at both ends, solid bone covering the outside, conditions which oppose fracture, and produce increased strength, indeed greater strength and lightness than a solid bone would have. Below the shaft is an expansion, on which are placed the surfaces for the jointing on of the two bones of the fore-arm, and the bone is especially in old Gorillas perforated there, a condition seen in some very old human bones. There is an important point in the relative length of the upper arm-bone, and the bones of the fore-arm in the Gorilla, in other Apes, and in man, for in this great Ape and in us the humerus is longer than the others, and in the Chimpanzee they are almost equal, whilst in the rest of the Monkeys they are very unequal, the bones of the fore-arm being much the longest.

Although they have such strong arms, covered with a stout skin and with hairs sloping downwards, the Gorillas sometimes manage to break them, and then Nature endeavours to repair the injury. In the skeleton of the old male Gorilla in the British Museum there are proofs of a former fracture of the humerus or upper arm-bone. The arm was broken across, and as it could not be kept quiet, Dame Nature has not done her work as well as a modern surgeon could on a patient whose arm he could put in splints, for it is thickened, shortened, and twisted.

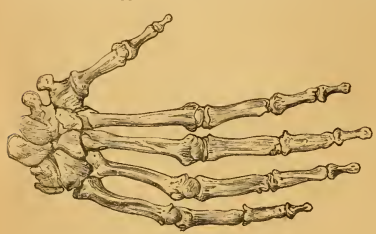
The fore-arm of the Gorilla has its long hairs pointing upwards to the elbow, and the limb does not slope gracefully towards, and become slightly smaller above the wrist, as in man, but remains thick and fleshy as far as the hand. There are two bones in the forearm which are jointed above with the lower end of the arm-bone (humerus), and which are also connected by joints at their lower ends with the small bones forming part of the wrist. The bones of the fore-arm are called the radius and the ulna in the Gorilla as in man. They are larger, stouter, and wider apart in the great Ape than in ordinary Europeans, but they greatly resemble those of the Australian aborigines. As these bones are covered with muscles, some going to the fingers, and others coming from the upper arm, there are many ridges or surfaces on them, for their origin and attachment, and these greatly resemble those of man; moreover, the muscles perform the same functions and movements.

When compared with that of a strong man, the wrist of the Gorilla is broader, and the bones, of the same number, are larger from side to side, and this extra breadth makes this part of the hand very wide. As the Gorilla's hand often has to support the weight of the body, on the back of the fingers and knuckles, it is long, broad, and very strong, surpassing in these respects those of man; but the thumb is peculiar. It does not look a well-formed one: it is evidently short, and out of proportion to the long fingers. The human thumb reaches not far from the second joint of the forefinger; but the top of that of the Gorilla is on a level with the first joint, or at the end of the long bones of the hand, and which are called metacarpal bones.

Remarkable then for its breadth and thickness, the Gorilla's hand has also a long palm, which is not only due to the length of the bones, just mentioned, but also to the fact that the web or undivided skin between the fingers, where they join the hand, is not slight as in man, but long and very decidedly visible. The web extends half way up the first joint of the fingers. The fingers are therefore made to appear short* (although their bones are long), and they look dumpy and swollen, and this appearance is increased by there being callous pads of skin on the back of the middle and end joints. Finally, the fingers slope to the nails, which are not much larger or longer than those of man. The back of the hand is hairy as far as the divisions of the fingers; and the callous pads, just noticed, almost do away with the appearance of some of the joints. The short thumb, not so big as the forefinger, has a nail which does not reach the end of it, and the under-parts of the thumb, fingers, and palm have a bare skin. Professor Owen, in summing up the difference between the structure of the hands of the Gorilla and of man, remarks that in the great Ape the hands are instruments for great power of grasp, and for sustaining great weight, and the length and strength of the whole upper limb accord with their mechanical powers and requirements. In man, the framework of the hand bespeaks an organ of varied and delicate prehension, and the form and proportion of the rest of the arm-limb relate to the free motions and complex functions of the instrument.

* See page 16.

Having raised the arm by its muscles, the fingers and thumbs grasp an object, or, in other words, certain muscles which are placed between the bones of the fingers and between the fingers and the bones of the fore-arm, contract and move the bones, which are jointed. The tops of the fingers are bent on the palm, and the thumb is closed on them, and this continues as long as the contraction permits. All the apparatus for long-continued clasping is present in the Gorilla, and there are nearly the same kinds of muscles employed as in man. There are, however, some differences, to one of which it is necessary now to allude. The thumb, for instance, of the Gorilla is of great importance in grasping, but it has not to perform such complicated movements in other things as that of man. In man its movements are most wonderful, and by using one muscle after the other which belongs to it, it can be moved so as to describe a circle with its tip. This is done in the action of "twiddling," but also in many others where the will hardly influences the muscle, and where the thumb may be said to be moved unconsciously. Gorillas in their quietest and most reflective moods cannot indulge in the sober practice of twiddling, for an important twiddling muscle is absent in them. But it is no great loss, and perhaps it is a real gain, for this muscle would be in the way of rapid clasping, as it rather tends to keep the thumb from the fingers. Whilst the great Ape is thus deficient it has a muscle on the other side of the hand which is not possessed by man, and whose office appears to be to separate as far as is possible the fourth and fifth fingers (their first joints), and by so doing to enlarge the grasp of the whole hand. As the hand of the Gorilla is at least a third larger than that of the averaged-sized man, there is of course a corresponding increase in the space which can be grasped. The muscles are stronger and stouter than in us, and therefore the hand is a more powerful one. Nevertheless it is incompetent of performing many actions which are readily done by a child.



HAND BONES OF THE GORILLA.

Having lifted up the arm in the act of climbing, and having grasped something, the third motion commences, the object being to draw up the body to the wrist and fingers, which of course remain as fixed points. All the muscles which intervene between the fore-arm bones and the spines of the back have to contract and shorten, so as to bring the last-named bones towards the fixed point, and they may be divided into *three* groups—those which reach from the arm-bones to the blade-bone, those which connect the blade-bone and the back-bone, and those which unite the arm and the back-bone. All contract at once and shorten the distance between the body and the arm; some fix as it were the blade-bone, and twist it slightly, placing it in a straight line for the pulling of others; and the most important bend and pull down the elbow. Two muscles may be noticed in particular. One which has already been noticed forms the lump on the front of the arm when the wrist is brought close to the shoulder, and is called "biceps," because it has two heads or points of adhesion to the blade-bone, not far from the joint of the arm-bone. The fibres pass over the arm from the blade-bone down to one of the bones of the fore-arm, in front of the bend of the elbow, and when they contract they tend to bend the elbow and bring the wrist near the shoulder, or the shoulder near the wrist when the fingers are fixed or clasping. The biceps of the Gorilla is a vast muscle, but it wants the symmetry of that of man, and it does not taper downwards so as to make the arm narrower above the elbow. Another muscle is at the back part of the arm, and from having three upper heads or attachments is called the "triceps." Two of the heads are attached to the arm-bone, and one to the blade-bone, and the lower one is fixed on to the piece of bone of one of the fore-arm bones, on which the arm rests when "elbows are on the table." Its action is to drag the blade-bone towards that bone, and it is assisted in this by a muscle which passes from the spine to the arm-bone, and whose office in climbing is to drag the spine towards the arm. Finally, there are numerous muscles which

pass from the long spines of the pieces of the back-bone (vertebræ) to the blade-bone, and which in climbing tend to drag the first towards the last-mentioned bones, and to move the body generally upwards. The huge size of the blade-bone assists in this in the Gorilla, as its large surface can give adhesion to larger muscles than a smaller one; and as the arm-bones are large, there is all the more room for muscular play.

Considering the bulk of the body of a Gorilla, and the nature of the movements of climbing, it is to be expected that those muscles and bones which are connected, as just stated, with the blade-bone, should be large and strong. This is remarkably the case. On examining the back of a Gorilla one is struck with the great projection of the back-bones in the neck. In man each back-bone or vertebra has a projection or spine which sticks out backwards more or less. These are small in the region of the neck, but in the Gorilla these spines are very long there, and give a peculiar hump-necked appearance. Their size, however, is in exact relation with the size and strength of the muscles attached to them, and some of these go to the blade-bone to assist in the act of climbing.

It is this hump-necked appearance and the round-backed look produced by the great size of the blade-bones which make a Gorilla so ugly about the chest and head, but beauty is of much less use in an African forest than good stout bones and active muscles.

The hind part of the neck does not form a graceful curve as in a well-made man, but a projection which gradually slopes into the line of the back. Moreover, the shoulders of the Gorilla do not slope from the neck—on the contrary, their direction is that which renders the hand-over-hand movement of climbing the readiest of commencement. They are "high," as the term is, the head and neck being as it were sunken between them, so that the chin, instead of being on a much higher level than the top of the breast-bone, is naturally lower than it. The front of the neck is thus hidden by the huge lower jaw.

Gorillas have collar-bones which are in the same position as those in man, but they are straighter, stouter, and stronger: they are not placed almost horizontally between the front of the blade-bone and the breast-bone, as in us, but as the shoulders are "high" they slant downwards to the breast-bone. By placing the hand on the upper part of the opposite side of the chest the collar-bone may be felt with the tips of the fingers like a ridge, and it is one which many know to their cost is very readily broken by a fall on the end of the shoulders. The bone is something like the letter *f* in outline, without the cross-bar, and it is fixed at both ends: so when a force acts on one end in the direction of the length of the bone it tends to bend, and often cracks and breaks across.

Now a fractured collar-bone would be a serious thing to a Gorilla; he could no longer lift up his arm, and he would be in constant peril and difficulty; hence, Nature has given him not only a very strong and straight bone, but has by the "high" shoulder posture rendered a fall on the top of it almost impossible. A fall would probably injure the upper part of the arm, which is well protected by the thick cushion of muscle, flesh, and hairy skin which covers the bone.

Travellers and hunters have noticed the rapidity and ease with which the Gorilla moves when off the ground, and when the size and the weight of the animal are considered it becomes evident that not only must it have great muscular power but a stout heart, good circulation, and capital "wind."

It must be remembered also that it is a great eater of vegetable food, and that it has to consume a large quantity to obtain a supply of nourishment: in other words, it has a very capacious stomach, which has to be carried about and kept very well filled.

In order to meet these requirements there is a very capacious chest (much more so than in man), which contains the large lungs and heart, and the belly is flaccid and large, so that the stomach need not press upwards and interfere with the breathing, or with the action of the circulation. Man has twelve ribs on either side, but the Gorilla has thirteen, each of which is longer, stouter, and broader than ours, the result being to make the cavity enclosed by them the greater, but apparently less readily influenced by the muscles of respiration.

When we breathe deeply and endeavour to inspire more than is usual we employ certain muscles which act on the ribs, enlarging the cavity of the chest, and then diminishing it as the expiration occurs. The larger the spaces between the ribs, and the more elastic the ribs themselves, the greater is their possible amount of movement. In us it is very great in the child, great in man, but much less in old age, when the elasticity of the ribs diminishes. In the Gorilla, the breadth and strength of the ribs

keep the cavity of the chest always vast, and certainly from their solidity and from the small space which exists between the successive ribs, great and unusual efforts of respiration are not very possible. So large is the cavity of the chest in the Gorilla, and so capacious are the lungs, that it is possibly not necessary for it to put itself out of breath, and to call extraordinary muscular exertion into play, during its uneventful life.

Having thirteen ribs on either side, and each rib being attached to a separate bone of the spine, the Gorilla has therefore one more spine bone (vertebra) than man, and is all the more long-backed. Moreover, the breast-bone, which is on the front of the chest, is broader in the Gorilla than in man, and at least one-third longer, thus adding to the capacity of the cavity of the chest, making it of about 500 cubic inches; that of man being 330 cubic inches.

The lungs and heart of the great Ape resemble those of man, and the great arteries are given off from the main blood-vessel in the same manner in both.

The Gorillas appear to be great eaters, and to roam about, either in small bands or alone, seeking for their favourite food in the forest, and the plantations close by. Sometimes they seek the high plains and rough ground of the hills, especially where certain trees are found, and they invariably cling to the forests about water. They eat the cabbage of the palm nut tree, and partake of the papau, banana, and amomum fruits. Wild sugar-canes attract them, and they are especially fond of the succulent white parts of the pine-apple and its leaves. Some hard kinds of nuts are readily cracked with their huge teeth, which are also brought into use in tearing open the stems of juicy plants.

All the examinations of the dead bodies of the Gorillas prove their diet to consist of such things, and the remains of berries, pine-apple leaves, and other vegetable matters were found, but not flesh or anything like it. This food is, however, not very nourishing, and it must be taken in large quantities and frequently. Hence the animal must not only have good climbing powers to get his food, but a large stomach and intestines to digest it rapidly. There is no doubt that the figure of the Gorilla testifies to its kind of food. The abdomen is very large, and sticks out when the animal is in the erect position; its paunch is vast, and therefore the bones which support it below, or the haunch bones, are very wide.

These haunch-bones form part of a girdle of bones which, in a skeleton, unites the legs to the spine, and which contains, in living animals, the bladder, part of the reproductive organs, and the unborn young.

It is called the pelvis, or basin-shaped bone (being very unlike one); its upper edge is formed by the expanded haunch, or ilium bones (ilium, or gut, alluding to the support given by the bone to the bowels), and its lower one by the bones on which men and Gorillas sit, or the hip (the ischium, or hip-bone). In the Gorilla the pelvis is enormous, and the edge of the haunches is long, so as to give attachment to the muscles which enclose the vast digestive apparatus behind and at the side, but it does not form a graceful curve behind and below, for certain muscles which are of great use to man in maintaining the erect posture, and which straighten the thigh in the body, are weak in the great Ape. These muscles originate outside and below the top of the haunch, and when large and strong, require a peculiar shape of bone: they form in man what does not exist in the Gorilla, and that in which the Hottentot Venus glories. But the Gorilla can sit just as well upon a pair of short and expanded hip-bones (ischial tuberosities, in the language of anatomists), and as he has no tail (the bones forming it in other Monkeys being diminished in number and united in a short process), he can do so for a considerable time with comfort. The sitting in the upright position is moderately easy to the Gorilla, and the older ones evidently often do so. They squat and rest their broad backs against a tree, and as this is a very constant and favourite position, they wear a good deal of their back hair off.

The fate of a hunter is thus given by Du Chaillu, who pledges himself to three very debatable points: that the Gorilla meets its enemy erect; stands and fights; and kills by a blow across the abdomen:—"We set off towards a dark valley where Gambo said we should find our prey. The Gorilla chooses the darkest, gloomiest forests, for its home is found on the edges of the clearings only when in search of plantains, sugar-canes, or pine-apples. Often they choose for their peculiar haunt a wood, so dark that even at midday one can scarce see ten yards. This makes it the more necessary to wait till the monstrous beast approaches near before shooting, in order that the first shot may be fatal. It does not often let the hunter reload. Our little party

separated, as is the custom, to stalk the wood in various directions. Gambo and I kept together. One brave fellow went alone, in a direction where he thought he could find a Gorilla. The other three took another course. We had been about an hour separated, when Gambo and I heard a gun fired, but a little way from us, and presently another. We were already on our way to the spot, where we hoped to see a Gorilla slain, when the forest began to resound with the most terrific roars. Gambo seized my arm in great agitation, and we hurried on, both filled with a dreadful and sickening alarm. We had not gone far when our worst fears were realised. The poor brave fellow, who had gone off alone, was lying on the ground in a pool of his own blood, and I thought, at first, quite dead. His bowels were protruding through the lacerated abdomen. Beside him lay his gun. The stock was broken, and the barrel was bent and flattened. It bore plainly the marks of the Gorilla's teeth. We picked him up, and I dressed his wounds as well as I could with rags torn from my clothes. When I had given him a little brandy to drink he came to himself, and was able, but with great difficulty, to speak. He said he had met the Gorilla suddenly, and face to face, and that it had not attempted to escape. It was, he said, a large male, and seemed very savage. It was in a gloomy part of the wood, and the darkness I suppose made him miss. He said he took good aim, and fired when the beast was only about eight yards off. The ball merely wounded it in the side, and it at once began beating its breasts, and with the greatest rage advanced upon him. To run away was impossible, for he would have been caught in the jungle before he had gone a dozen steps. He stood his ground, and, as quickly as he could, reloaded his gun. Just as he raised it to fire, the Gorilla dashed it out of his hand, the gun going off in the fall; and then in an instant, and with a terrible roar, the animal gave him a tremendous blow with its immense open paw, frightfully lacerating the abdomen, and with this single blow laying bare part of the intestines. As he sank bleeding to the ground, the monster seized the gun, and the poor hunter thought he would have his brains dashed out with it. But the Gorilla seemed to have looked upon this also as an enemy, and in his rage almost flattened the barrel between his strong jaws."

In spite of this anecdote, and some drawings by Du Chaillu, which represent the Gorilla standing erect, it is very doubtful, from anatomical reasons, whether this is possible. The comparative smallness of some of the most important muscles in the Gorilla, which in man produce the erect position, has already been noticed, and it is now necessary, for the same reasons, to examine into the nature of the lower limbs.

The thigh-bone (called from the Latin, *femur*) of the Gorilla is shorter than the arm-bone, the reverse being the case in man; and hence the Ape appears to be too short in the legs for its long body and arms. It is stout and rather straight, and has not the forward bend of the same bone in man: moreover, some well-marked ridges which run down the back of it, and which were exceedingly well developed in the oldest races of men, are deficient in the Gorilla. The same may be said for the markings on the bone, which indicate the presence of powerful muscles whose action is to keep the thigh straight with the back—or in other words, to keep the body erect. Below the knee are the two bones of the leg: the inner one, or shin-bone (the tibia), is very short for the height of the animal, and the joint on its lower part, on which moves the ankle-bone, is not so deep and perfect as in man, whose weight is constantly to be borne on it whilst it is being moved in walking. The little outside bone, called *fibula*, or the clasp-bone, in the Gorilla is so made that it adds singularly to the inability to maintain the erect posture whilst walking, and even in standing still. The lower end of this bone in man forms the prominence outside the ankle, and covers and protects the outside of the topmost bone of the ankle, to which the foot is attached. It strengthens it and prevents that turning in of the foot, which is antagonistic to the placing the sole flat on the surface of the earth, so that it can receive the weight of the body on its broad space and allow of the position so characteristic of man. In the Gorilla this bone does not come down as far as the ankle, and all the safeguards against in-twisting are not present. Why, is clear enough, because the Gorilla treads on the outside of its foot-like hand, and always has the sole turned in. There are some other points which require to be noticed, however, about the leg. It is short and evidently wanting in "calf." It is therefore deficient in that symmetry of which many mortals are most proud. Nevertheless, it has a high instep, also a human desideratum; but in spite of this the ankles are thick and shapeless-looking. The tendon which

reaches from the calf to the back heel-bone (os calcis) gives a slender appearance to the lower limb of man, but there is no myth about a Gorilla having been held by that slim spot and dipped in Styx, so to be for ever invulnerable elsewhere. This tendon (tendo Achillis) so characteristic of man, is supplied with muscular fibres close to its insertion into the heel-bone in the Gorilla, which thus gains in strength what it loses in elegance. A snapping of the tendon would be indeed a grave matter in the huge Ape, and Nature has thus provided against this accident.

The thick ankles of the Gorilla are rather exaggerated by the hair which covers them, and

HUNTING THE GORILLA.

it is found over the whole of the upper surface of the foot to the clefts of the toes. The sole is not thus covered, and its bare state enables grasping to be performed with ease, while the absence of hair assists the delicacy of the sense of touch. Another cause of the ugly appearance of the foot is the backward projection of the heel, and the hand-like look is of course given by the great toe-thumb, which projects from the side of the foot at an angle of 60 degrees at least. The sole is narrow behind, and expands to where the great toe-thumb projects, so as to become very wide close to the clefts between the other toes. It is marked with lines or indentations, and there is a kind of pad beneath the ball of the great toe-thumb. The Gorilla seizes objects and grasps boughs with its feet, the great toe-thumb being exceedingly movable to and fro as well as across the sole of the foot. Hence the hand-like appearance of the foot and the thumb-like appendage of the great toe. Yet it is a foot, and the movable toe is not really a thumb.

Each kind of animal must be compared with others, some of which appear to be more complicated and some less highly organised, so that its peculiar construction can be comprehended. Man, as the perfection of living forms, is naturally considered the model or type with which all others should be compared, and therefore anatomists who begin by studying man name the bones, muscles, and other structures of animals after his. That is to say, any of their structures which are comparable with those of man, by their native position and use, are named similarly.

The question then arises, and can of course on this principle be answered, are the hinder extremities of the Gorilla feet or hands? do they resemble human feet or human hands in their anatomy, or in the arrangement of their bones, muscles, leaders, and blood-vessels?

By placing side by side the joined bones of the foot of man and those of the hind extremity of the Gorilla, it will be observed that the same number are present, and that they can be compared, as regards their shape and position, in a most remarkable and satisfactory manner.

A human foot is composed of three parts, so far as its bones are concerned. These are the toes, or the very movable bones in the front of the foot (1), and then there are five slender bones (2) placed side by side, and reaching from the toes to the pieces forming the back of the foot or ankle. The five bones thus parallel, and situated between the beginning of the toes and the ankle-bones, are counted from within outwards. That attached to the great toe is the first, and that to the little toe is the fifth. These are called metatarsal bones, and give length and narrowness to the foot, and they can be readily felt with the finger on our own bodies.

BONES OF THE ANKLE AND FOOT OF MAN.

BONES OF THE ANKLE AND FOOT OF THE GORILLA.

Behind them are the seven bones of the "tarsus," or ankle, all connected together in a strong arch, and jointed in front to the five bones just mentioned, and above to the two bones of the leg. The hindmost part of the ankle or heel is formed by the heel-bone, os calcis (3), which forms the back part of the arch of the sole. The Achilles tendon is united to it behind, and above it is jointed with a bone, on which rest the bones of the leg, the astragalus bone (4), so called from the Greek word, which means a "die," for the boys and men in the olden time tossed these bones, and played with those of the sheep as modern boys do.

There are two bones of the ankle just in front of these; one in contact with the heel-bone is called, from its shape, the cuboid or cube-shaped bone (5), and the other, jointed to the astragalus, is, from its faint resemblance to a boat or hull of a ship (navis), termed the navicular bone (6). In front of these two are three others placed side by side, and jointed in front to some of the metatarsal bones. They are called, from their wedge-shaped outlines (wedges for the arch of the foot), cuneiform bones (7), and there are the inner, middle, and outer of them. The inner is curved on its front surface, and has a joint there for the end of the slender (metatarsal) bone of the great toe. It is longer than the next wedge-shaped bone, so that just a little spot of the second slender bone of the second toe touches it close to the corresponding one of the great toe. This inner wedge-shaped bone, the metatarsal bone of the great toe, and the joints of the toe itself, are all on a line, which is parallel to the bones of the next and other toes. The middle and the outer wedge-shaped bones have each a slender metatarsal bone attached to them, and the two remaining slender metatarsals are jointed on to the cube-shaped bone which projects in front of the heel-bone (os calcis). It is the length in front, and the solidity and arched form of the ankle, together with the *parallel* direction of all the slender

metatarsal bones, which give the human foot its beauty of form, strength, and ability to sustain the weight of the body flat on the sole. Compare the hinder grasping (so-called) hand of the Gorilla with this.

At first sight there is a great difference, for the great toe and its metatarsal bone form *an angle* with the bones of the other toes and their metatarsals. Instead of the toes and their slender bones being parallel and fixed in this position, the great toe of the Gorilla has a power of moving so as to cross the foot more or less below, as the human thumb can cross the palm. It has also the capacity of being stretched out from the foot, so that its movements greatly resemble those of a thumb. In fact, we want a word to express a toe-thumb.

On examining the foot carefully, it will be found that each of its bones may be compared and identified in position and office with the same in man. There is a heel-bone with a great projection behind, for the fixing on of the Achilles tendon, and this is jointed on to a bone above, like the human die-bone or astragalus, and to one in front, like the cuboid. The astragalus resembles that of man, but the upper and outer surfaces on which the lower ends of the leg-bones move, are slightly different, so as to admit of greater turning in of the ankle. The wedge-shaped bones are there, and the inner one, with its joint for the slender bone of the great toe, is shorter and broader than in man, so as to allow of great movement of the toe-thumb in front of it. The slender bones, or metatarsals, are larger and longer, but their shape and direction, with the exception of the first, are singularly like those of man. As a whole the foot of the Gorilla, for thus it must be called, is broader in front of the ankle-bones and longer everywhere than in us, but it has a sideway and almost club-foot look about it; its position is "turned in," like the foot of a young child before it walks. This is owing to the conformation and easy jointing of the bones of the ankle and foot, and also to the action of a front muscle of the leg which pulls the very movable bones inwards. The structures allow of a very ready turning in of the ankle and foot, and such as would render climbing easy with the aid of the toe-thumb; but they evidently interfere with the steadiness in walking. It is a huge foot, and it is only half an inch or so shorter than the leg below the knee; it is unwieldy as a foot, but is a capital foot-hand, which cannot readily have its toes stretched out straight, for their usual position is that of being slightly bent in the direction of the sole.

Mr. Walker purchased from a native a fine healthy male Gorilla, apparently about two years of age, and shipped it for England. Being under the impression that he had taken too much care of all the other living ones which he had obtained at different times, he determined to let the new acquisition have its own way, and only take care that it did no mischief. When purchased, the animal was by no means strange or spiteful, but rather what may be termed shy, and suspicious of strangers. At the expiration of about a week, however, it became sufficiently tame and confiding to admit of its being allowed to run about loose, and to do as it liked. At the same time its food, instead of being confined to the fruits on which it is supposed to feed in its wild state, consisted in general of fragments from the table, and beside these it had anything edible it could lay its hands on, and occasionally a basin of condensed milk and a raw egg beaten up in it was given. It liked amomum fruit, but this produced diarrhœa, which had to be treated with chlorodyne and raw egg. Finding that the animal became restive, it was left entirely to its own devices, and especially as every one in the ship was at the same time so very busy as not to be able to pay much attention to it. It soon became quite at home, alternately eating, sleeping, and playing with a large bull-terrier (of by no means the most amiable disposition), which had a most decided dislike to negroes, but nevertheless took very kindly to the Gorilla, so that the two animals became constant playfellows. By allowing the Gorilla to rough it, instead of watching it, and appointing someone to take care of it, in which case these animals become so much attached to their keeper or attendant, that a separation from him almost invariably causes these affectionate Apes to pine away and die, and by habituating it to such food as is generally to be found on shipboard, it was hoped that it might be brought to England. But accidents will happen, even to Gorillas. It came down to dinner one day, and ate scraps with the dog, and went to sleep. When looked for, some hours afterwards, it was missing, and must have fallen off the taffrail into the sea. Strangely enough, this young one was not given to climbing. It will be noticed that these remarks are totally at variance with those of M. Du Chaillu, who was impressed with the untamable character of the Gorilla; so we must wait until further evidence is produced, and probably until a little Gorilla is safely lodged in the Regent's Park.

Many attempts have been made to obtain a live Gorilla for exhibition in Europe, and some years since a showman really had one which he called a Chimpanzee, but the fact was not known to scientific men until a photograph of the creature was exhibited after its death. In June, 1876, Mr. Moore, the learned curator of the Free Public Museum, wrote to the *Times* after seeing a young Gorilla in Liverpool. He stated—"A veritable young living Gorilla was yesterday brought into Liverpool by the German African Society's Expedition, which arrived by the steamship *Loanda*, from the West Coast. The animal is a young male, in the most perfect health and condition, and measures nearly three feet in height. Its beetling brows, flattened podgy nose, black muzzle, small ears, and thick fingers, cleft only to the second joint, distinguish it unmistakably from the Chimpanzee.

"Could it have graced our own Zoological Gardens it would have been the lion of the day; for, in addition to the great scientific interest of the species, the abounding life, energy, and joyous spirits of this example would have made it a universal favourite. Courteously received at Eberle's Alexandra Hotel by the members of the Exhibition, I found the creature romping and rolling in full liberty about the private drawing-room, now looking out of the window with all becoming gravity and sedateness, as though interested, but not disconcerted, by the busy multitude and novelty without, then bounding rapidly along on knuckles and feet to examine and poke fun at some new comer; playfully mumbling at his calves, pulling at his beard (a special delight), clinging to his arms, examining his hat (not at all to its improvement), curiously inquisitive as to his umbrella, and so on with visitor after visitor. If he becomes over excited by the fun, a gentle box on the ear would bring him to order like a child, like a child only to be on the romp again immediately. He points with the index finger, claps with his hands, pouts out his tongue, feeds on a mixed diet, decidedly prefers roast meats to boiled, eats strawberries, as I saw, with delicate appreciativeness, is exquisitely clean and mannerly. The palms of his hands and feet are beautifully plump, soft, and black as jet. He has been eight months and a half in the possession of the Expedition, has grown some six inches in that time, and is supposed to be between two and three years of age." Nearly every other attempt to rear them in Europe has failed. The Zoological Society has, at rare intervals, possessed specimens of young Gorillas, but the climate of England would appear to be quite unsuited to them, for, despite Mr. Bartlett's every care and attention, none of these interesting creatures survived for any length of time.

Du Chaillu insists on the ill-temper, ferocity, and untamable nature of the young Gorilla, as the results of his experience. One was brought to him about three years of age, with its neck put in the cleft of a stick to keep it quiet, and after much trouble they got it into a bamboo cage. It was a little black thing of two feet six inches in height, and its habits, escapes, and death are amusingly told. "As soon as I had the little fellow safely locked in his cage, I ventured to approach to say a few encouraging words to him. He stood in the furthest corner, but, as I approached, he bellowed and made a precipitate rush at me; and though I retreated as quickly as I could he succeeded in catching my trouser leg, which he grasped with one of his feet, and tore, retreating immediately to the corner furthest away. This taught me caution for the present, though I had a hope still to be able to tame him. He sat in his corner looking wickedly out of his grey eyes, and I never saw a more morose or more ill-tempered face than had this little beast. The first thing was, of course, to attend to the wants of my captive." I sent for some of the forest-berries which these animals are known to prefer, and placed these and a cup of water within his reach. He was exceedingly shy, and would neither eat nor drink till I had removed to a considerable distance. The second day found Joe, as I had named him, fiercer than the first. He rushed savagely at any one who stood even for a moment near his cage, and seemed ready to tear us all to pieces. I threw him some pine-apple leaves, of which I noticed he ate only the white parts. There seemed no difficulty about his food, though he refused now, and continued during his short life to refuse, all food except such wild leaves and fruits as were gathered from his native woods for him. The third day he was still morose and savage, bellowing when any person approached, and either retiring to a distant corner or rushing to attack. On the fourth day, while no one was near, the little rascal succeeded in forcing apart two of the bamboo rails which composed his cage, and made his escape. I came up just as his flight was discovered, and immediately got all the negroes together for pursuit, determining to surround the wood and recapture my captive. I was startled by an angry growl issuing from under my low bedstead. It was Master Joe, who lay there hid, but anxiously watching my movements. I instantly shut the windows, and called to

my people to guard the door. When Joe saw the crowd of black faces he became furious, and, with his eyes glaring, and every sign of rage in his little face and body, got out from beneath the bed. We shut the door at the same time and left him master of the premises, preferring to devise some plan for his easy capture rather than to expose ourselves to his terrible teeth. How to take him was now a puzzling question. He had shown such strength and such rage already, that not even I cared to run the chance of being badly bitten in a hand-to-hand struggle. Meantime Joe stood in the middle of the room looking about for his enemies, and examining, with some surprise, the furniture. I watched with fear, lest the ticking of my clock should strike his ear, and perhaps lead him to an assault upon that precious article. Indeed, I should have left Joe in possession, but for a fear that he would destroy the many articles of value or curiosity I had hung about the walls. Finally, seeing him quite quiet, I dispatched some fellows for a net, and opening the door quickly, threw this over his head. Fortunately we succeeded at the first throw in perfectly entangling the young monster, who roared frightfully, and struck and kicked in every direction. I took hold of the back of his neck, two men seized his arms, and another the legs, and thus held by four men this extraordinary little creature still proved most troublesome. We carried him as quickly as we could to the cage, which had been repaired, and there once more locked him in. I never saw so furious a beast in my life as he was. He darted at every one who came near, bit the bamboos of the house, glared at us with venomous and sullen eyes, and in every motion showed a temper thoroughly wicked and malicious. As there was no change in this for two days thereafter, but continual moroseness, I tried what starvation would do towards breaking his spirit; also, it began to be troublesome to procure his food from the woods, and I wanted him to become accustomed to civilised food, which was placed before him. But he would touch nothing of the kind; and as for temper, after starving him twenty-four hours, all I gained was that he came slowly up and took some berries from the forest out of my hand, immediately retreating to his corner to eat them. Daily attentions from me for a fortnight more did not bring me any further confidence from him than this. He always snarled at me, and only when *very* hungry would he take even his choicest food from my hands. At the end of this fortnight I came to feed him, and found that he had gnawed a bamboo to pieces slyly, and again made his escape. Luckily he had but just gone; for, as I looked around, I caught sight of Master Joe making off on all-fours, and with great speed, across the little prairie, for a clump of trees. I called the men up, and we gave chase. He saw us, and before we could head him off made for another clump. This we surrounded. He did not ascend a tree, but stood defiantly at the border of the wood. About one hundred and fifty of us surrounded him. As we moved up he began to yell, and made a sudden dash upon a poor fellow who was in advance, who ran, tumbled down in affright, and, by his fall, escaped, but also detained Joe sufficiently long for the nets to be brought to bear upon him. Four of us again bore him, struggling, into the village. This time I could not trust him to the cage, but had a little light chain fastened around his neck. This operation he resisted with all his might, and it took us quite an hour to securely chain the little fellow, whose strength was something marvellous. Ten days after he was thus chained he died suddenly. He was in good health, and ate plentifully of his natural food, which was brought every day for him; did not seem to sicken until two days before his death, and died in some pain. To the last he continued entirely untamable; and, after his chains were on, added the vice of treachery to his others."

In one of his hunting excursions Du Chaillu obtained a younger Gorilla than the last, but its end was sad enough.

"I was accessory to its capture," writes Du Chaillu, "and we were walking along in silence, when I heard a cry, and presently saw before me a female Gorilla, with a tiny baby Gorilla hanging to her breast and sucking. The mother was stroking the little one, and looking fondly down at it; and the scene was so pretty and touching that I held my fire, and considered—like a soft-hearted fellow—whether I had not better leave them in peace. Before I could make up my mind, however, my hunter fired and killed the mother, who fell without a struggle. The mother fell, but the baby clung to her, and, with pitiful cries, endeavoured to attract her attention. I came up, and when it saw me it hid its poor little head in its mother's breast. It could neither walk nor bite, so we could easily manage it; and I carried it, while the men bore the mother on a pole. When we got to the village another

scene ensued. The men put the body down, and I set the little fellow near. As soon as he saw his mother he crawled to her, and threw himself on her breast. He did not find his accustomed nourishment, and I saw that he perceived something was the matter with the old one. He crawled over her body, smelt at it, and gave utterance, from time to time, to a plaintive cry—'Hoo, hoo, hoo!' which touched my heart. I could get no milk for this poor little fellow, who could not eat, and consequently died on the third day after he was caught. He seemed more docile than the other I had, for he already recognised my voice, and would try to hurry towards me when he saw me. I put the little body in alcohol, and sent it to Dr. Wyman, of Boston, for dissection."

Of course all the stories about the Gorilla are not believed, and those of all writers, from Hanno downwards, have been severely criticised.

A distinguished African traveller, Winwood Reade, stated that the name, leaving alone the stories, of Hanno, was a blunder, and that the word Gorilla was misapplied, because the habits of the creature do not tally with the story. The Gorillæ of Hanno were found, it is supposed, on Sherboro Island; they scaled rocks and defended themselves with stones. They could neither have been Gorillas nor Chimpanzees, but a species of Cynocephalus, or Dog-faced Monkey or Baboon. "These animals," writes this author, "which I have seen often enough, go in troops, which Gorillas do not, and actually defend themselves with stones, a fact which I assert not only on the evidence of natives, but on the evidence of white men who have kept them in a state of captivity. They are also very ferocious, and will always defend themselves when attacked either by man or beast. I spent five months," he continues, "in the Gorilla country, and did not leave that part of Africa till I had completely satisfied myself respecting the habits of this animal. The evidence which I now lay before you is composed of statements made to me by men who had killed Gorillas. It is collected from three distinct parts of Equatorial Africa, namely, from the Balengi of the Muni River, from the Shekani and Fans, of the Gaboon, and from the Commi, Bakeli, &c., of the Fernando Vaz. But from the last river, where Gorillas are plentiful, I obtained the most information."

"The Gorilla is found in those thick and solitary places of the forest where animal life is scarce. His food is strictly vegetable. He moves along the ground on all-fours, sometimes he goes up into trees to feed on fruit, and at night he sleeps in a large tree. When the female is pregnant, the male builds a nest, where she is confined, and which she abandons as soon as her young one is born. The Gorilla does not beat its breast like a drum. It utters a kind of short sharp bark when enraged, and its ordinary cry is of a plaintive nature. With respect to its ferocity, the hunters have a proverb, 'Leave a *Ngina* alone, and it will leave you alone.' When it is at bay, and wounded, it will attack man like the stag, the elephant, and other animals which are naturally timid. But it makes its attack on all-fours, and the hunters, who are themselves as nimble as Apes, often escape from it as men escape from the charge of an elephant. I have seen a man who was wounded by a Gorilla; his wrist was crippled, and the marks of the teeth were visible. He told me that the Gorilla seized his wrist, and dragged it into his mouth; it was contented with having done this, and then made off. The nearest approach to an erect posture which the Gorilla attains is by supporting itself by hanging on to the branches. When I asked the people of Ngumbi whether a man had ever been killed by a Gorilla, they said that their fathers had spoken of such a thing, but that nothing of the kind had happened within the memory of anybody living. Such is the evidence of the native hunters upon the habits of the Gorilla. I could not find that it differed in any important respect from the Chimpanzee, except in its superior size and strength, and in its certainly being more formidable when wounded. But when I asked the hunters which was the most dangerous, the Leopard or the Gorilla, they replied the 'Leopard.'

"I can make one or two positive assertions from my own experience. Although I never succeeded in viewing a Gorilla in its wild state, I can assert that it travels on all-fours, for I have seen the tracks of its four feet over and over again. I can assert that it runs away from man, for I have been near enough to hear one running away from me; and I can assert that the young Gorilla is as docile as the young Chimpanzee in captivity, for I have seen them both in a state of captivity. I have also seen the lying-in nests both of Chimpanzees and Gorillas, the latter being the larger of the two. The Chimpanzee has the character of being more intelligent than his big brother." This careful traveller doubted some of the stories told by M. Du Chaillu about Gorilla killing, so he went to the

neighbourhood where this slaying was said to have taken place. On arriving at the town of Ngumbi pretending to be trading, he writes, "I was asked whether I would buy Gorillas as M. Du Chaillu did. I refused to buy them, but said that I would give a large reward to any hunter who would get me a shot at one, and also a present to the King. They seemed astonished at this, and asked me why I wished to do a thing that other white men had never wished to do. Now, I had taken with me two interpreters, and managed to make them quarrel, so that there might be no collusion in the matter. I examined Etia, a hunter, in whose company M. Du Chaillu professes to have killed Gorillas, by each interpreter separately. I examined in the same manner the five guides who had escorted him in the Opingi country; and though they spoke of M. Du Chaillu in high terms, and appeared to have a great affection for him, all replied that he had never shot a Gorilla."

YOUNG GORILLA AND DOG.

Still later accounts from able naturalists confirm Winwood Reade's views, and insist upon the truth of the fact that no European has ever seen a Gorilla in its adult age alive, and in its native forests. They start off at the slightest noise, and are only hunted by natives for the sake of their bones and skins, which are valuable enough in Europe. Moreover, exception has been taken to the tales about the intractable and violent nature of the Gorilla, and more than one well-known African naturalist sides with those who disbelieve in the ferocity of the young Gorilla.

The reason why the Gorilla flourishes in Western Equatorial Africa is probably because the great Carnivora, or beasts of prey, are not found in the dense forests and open prairies which cover the country. The jungle begins where the sea ceases, and then comes the virgin forest, extending some degrees north and south of the equator, and reaching unknown distances inland. There are no Lions, and but few Leopards, Hyenas, and Jackals to be met with; the great African beasts—the Rhinoceroses, Giraffes, Zebras, &c.—are absent. Snakes, Lizards, and a vast insect world abound, and there are birds of prey. The Elephant is scarce, and, indeed, miles and miles may be traversed without

hearing or seeing any signs of large animal life. But of all the mammals the Monkeys are the most numerous, and the Gorilla reigns supreme. He has the forest to himself, and but few enemies. He has companions, however, nearly of his own size, and whose description we owe to Du Chaillu, and they are so constructed, anatomically, that they link on, as it were, this greatest of all Apes with the well-known Chimpanzee, which is also indigenous to the Gorilla land. The new Apes are the Nschiego Mbouvé, or Tschiégo, and the Koolo-Kamba.

CHAPTER II.

THE MAN-SHAPED APES (*continued*)—THE NSCHIEGO MBOUVÉ—THE KOOLO-KAMBA—THE SOKO—THE CHIMPANZEE.

THE NSCHIEGO MBOUVÉ—Its Nests and Habits—A Specimen Shot—Differences between it and the Gorilla—Structural Peculiarities—THE KOOLO-KAMBA—Meaning of the Name—Discovered by Du Chaillu—Its Outward Appearance and Anatomy—THE SOKO—Discovered by Livingstone—Hunting the Soko—THE CHIMPANZEE—In Captivity—On board Ship—A Young Chimpanzee—The Brain and Nerves—Anatomical Peculiarities—General Remarks upon the Group.

THE NSCHIEGO MBOUVÉ.*

THIS great Ape, which attains the height of four feet, and has a spread of arms of seven feet, was discovered by Du Chaillu in the Gaboon district. It is remarkable for building very comfortable shelters, and this led to its being found; for Du Chaillu, in one of his excursions, was trudging along, rather tired of sport, when he saw a most singular-looking shelter built on the branches of a tree. He thought it had been made by the natives, and asked whether the hunters had the habit of sleeping in the woods, but was told, to his great surprise, that it was a nest built by the Nschiego Mbouvé, an Ape. Moreover, one of the natives told him that it was a curious creature, which had a bald head.

Many of the nests were seen subsequently, and it was noticed that they were generally built about fifteen or twenty feet from the ground, and invariably on a tree which stands slightly apart from others, and which had no lower bough beneath the shelter. Occasionally they are to be seen at the height of fifty feet; and it would appear that the altitude has something to do with the dread of the few flesh-eating and destructive beasts, such as the Leopard. The loneliest parts of the forest are chosen, for the animal is shy, and is very rarely seen, even by the negroes. The materials for the nest consist of leafy branches, and are collected by the male and the female also, who tie them together, and to the tree, very neatly with twigs of the vine. The roof is so well constructed that it closely resembles human work, and it throws off the rain admirably, for it is neatly rounded at the top. During its construction, the female gathers the branches and vines, whilst the male builds; but afterwards they do not occupy the same shelter, the male making another close by in a neighbouring tree. The roof, which is usually some six or eight feet in diameter, is more or less dome-shaped, or something like an extended umbrella; and the Nschiego gets under it and clasps the tree, or squats on a bough, so that its head is just beneath the under surface. The nests are not occupied permanently, and usually for not more than eight or ten days, for the Apes, living upon wild berries of a certain kind, select spots where they are plentiful, and leave them when the store is exhausted. Du Chaillu never saw many nests together, and he does not think the animals live in troops, but only in pairs. Sometimes a solitary nest is seen, inhabited by a Nschiego, whose silvery hair denotes its age, and probably its desire for solitude after a long and troublous life.

Being desirous of obtaining one of these shelter makers, as they were evidently new to science, Du Chaillu took every precaution to surprise his prey; but it is best to tell the story in his own words:—

"We travelled with great caution, not to alarm our prey, and had a hope that, by singling out a

* *Troglodytes Tschiégo* (Duvernoy); *Troglodytes calvus* (Du Chaillu).

shelter, and waiting till dark, we should find it occupied. In this hope we were not disappointed. Lying quite still in our concealment (which tried my patience sorely), we at last, just at dusk, heard the peculiar 'Hew, hew, hew,' which is the call of the male to his mate. We waited till it was quite dark, and then I saw what I had so longed all the weary afternoon to see. A Nschiego was sitting in his nest. His feet rested on the lower branch, his head reached quite into the little dome of the roof, and his arm was clasped firmly round the tree-trunk. This is their way of sleeping. After gazing till I was tired through the gloom at my sleeping victim, two of us fired, and the unfortunate beast fell at our feet without a struggle, or even a groan. We built a fire at once, and made our camp in this place, that when daylight came I might first of all examine and skin my prize. The poor Ape was

NSCHIEGO MBOUVÉ. (*From a Stuffed Specimen.*)

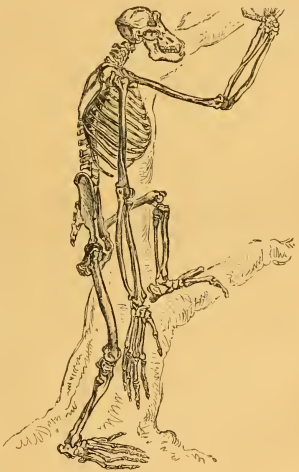
hung up to be out of the way of insects, and I fell asleep on my bed of leaves and grass, as pleased a man as the world could well hold. Next morning I had leisure to examine the Nschiego.

"I was at once struck with points of difference between it and the Chimpanzee. It was smaller, and had a bald black head. This is its distinctive character. This specimen was three feet eleven inches high, or long. It was an adult. Its skin, where there is no hair, is black, and the thick breast and abdomen are covered with short and rather thin blackish hairs. On the lower part of the abdomen the hair is thinnest, but this is not perceived unless looked at carefully, as the skin is the colour of the hair. On the legs the hair is of a dirty grey, mixed with black. The shoulders and back have black hair between two and three inches long, mixed with a little grey. The arms down to the wrist have also long black hair, but shorter than in the Gorilla. The hair is blacker, longer, glossier, and thinner in general than that on the Gorilla, and the skin is not so tough. I noticed that the bare places, where the hair is worn off by contact with hard substances in sleeping, were different from the bare places which are so conspicuous on the common Chimpanzee.

"It is not as powerful an animal as the Gorilla, its chest is not so large, but the arms and fingers are a little longer, and this is the case with the toes also. The nose is not so prominent, but the mouth is wider and the ears are larger. Its chin is rounder, and has more small hairs, and the side of the face is thinly covered with hair, commencing about the middle of the ear, and these would seem to be signs of an incipient beard and whiskers. The lower parts of the body are bare, and the skin is white there."

Apparently the disposition and temper of the Nschiego are better than those of the Gorilla; it is less ferocious, and is even docile in captivity. It has not the hideous expression of the great Ape, for there is something of a forehead above the ridge of the eyebrow, and there are no great crests on the head, which is rounder than that of the Gorilla. The teeth are rather smaller, but are of the same number. The height is less than that of the female Gorilla, as a rule; and the male of this bald kind is larger than its female; whilst the little young ones differ in their colour from both, being white. Finally, it would appear that there are hard callous pads on the back of the fingers, that the hand is larger than the feet, and that the tips of the fingers reach a little below the knee

Associated with the Gorilla and with the Chimpanzee in the forests of Equatorial Western Africa, the Bald-headed Troglodyte appears to have a restricted geographical range, and not to be found over so large a district as its companions, for it was only met with on the table-lands of the interior, and in the densest forests.



SKELETON OF NSCHIEGO.

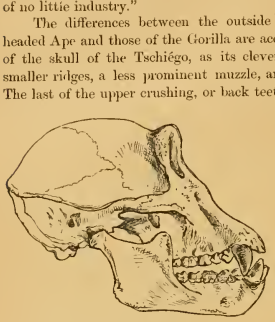
Subsequently Du Chaillu had a good opportunity of substantiating his statements about the nests.

"On our way down, at sunset of the third day, we heard the call of a Nschiego Mbouvé (*Troglodytes calvus*). I immediately caused my men to lie down, and was just getting into a hiding-place myself, when I saw, in the branches of a tree at a little distance, the curious nest or bower of this Ape; hard by, on another tree, was another shelter. We crept up within shot of this nest, and then waited, for I was determined to see once more the precise manner in which this animal goes to rest. We lay flat on the ground, and covered ourselves with leaves and bush, scarcely daring to breathe, lest the approaching animal should hear us. From time to time I heard the calls. There were evidently two, probably male and female. Just as the sun was setting, I saw an animal approach the tree. It ascended by a hand-over-hand movement, with great rapidity, crept carefully under the shelter, seated itself on the crotch made by a projecting bough, its feet and haunches resting on this bough; then it put one arm about the trunk of the tree for security.

"Thus, I suppose, they rest all night; and this posture accounts for some singular abrasions of hair on the side of the Nschiego Mbouvé. At a little distance off I saw another shelter made for the mate. No sooner was it seated than it began again to utter its call. It was answered; and I began to have the hope that I should shoot both animals, when an unlucky motion of one of my men roused the suspicions of the Ape in the tree. It began to prepare for descent, and, unwilling to risk the loss of this one, I fired. It fell to the ground dead. It proved to be a male, with the face and hands entirely black. As we were not in haste, I made my men cut down the trees which contained the nests of these Apes. I found them made precisely as I have before described, and as I have always found them, of long branches and leaves, laid one over the other very carefully and thickly, so as to render the structure capable of shedding off water. The branches were fastened to the tree in the middle

of the structure by means of wild vines and creepers, which are so abundant in these forests. The projecting limb on which the Ape perched was about four feet long. There remains no doubt in my mind that these nests are made by the animal to protect it from the nightly rains. When the leaves begin to dry to that degree that the structure no longer throws off water, the owner builds a new shelter, and this happens generally once in ten or fifteen days. At this rate the Nschiego Mbouvé is an animal of no little industry."

The differences between the outside appearance and the intelligence and temper of this Bald-headed Ape and those of the Gorilla are accompanied by certain internal ones. A careful examination of the skull of the Tschiégo, as its clever French describer, Duvernay, calls it, shows that it has smaller ridges, a less prominent muzzle, and a wider and shorter roof of the mouth than the Gorilla. The last of the upper crushing, or back teeth, is the smallest. In the Gorilla they are nearly equal in size. The lower jaw in the Nschiego has three nearly equal-sized molar or back teeth, and the first and the second have five projections or cusps, but the last has only four. In the Gorilla it has five cusps. These minute differences are probably constant, and therefore must not be passed over, although they may seem to be of no importance to the creatures. But the classification of animals can only depend upon the presence or absence of structural peculiarities; and when such and such a structure exists in one, and not in another, they cannot both be of the same kind. According to the relation of the structure to the life, and according to its being constantly found, so is it important in deciding whether the "kind" is a species, or a mere variety or race.



SKULL OF NSCHIEGO.

The great distinction between the two animals is that the Nschiego's forehead, formed by the frontal bone, rises up from the great brow ridge, and is visible from the front. This is not the case with the Gorilla, whose forehead recedes greatly. Both animals have the same number of ribs (thirteen), but those of the Nschiego are more man-shaped and are not so broad and close together; and their chests differ in breadth, for the breast-bone of the new Ape is narrower, but it is long and thick. The blade-bone, so important to the Gorilla, is equally so to the Nschiego, but it is longer and narrower on the back, and its spine is very oblique. Possibly this conformation of the bone may have to do with the constant climbing of the Bald-headed Ape, but nevertheless the spines on the neck-bones, which give origin to such exceedingly strong muscles in the Gorilla, are much smaller in the Nschiego. The first neck-bone, or atlas, has no spine in this Ape, in which it is like man, and the axis, or second, has a forked spine, and is crested at the end, but otherwise is like that in man.

Finally, the rudiment of a tail is like that end of the back-bone found in the Gorilla and in man.

These are the principal points and the most important distinctions; they show that the Nschiego cannot be of the same kind or species as the Gorilla, but is a Troglodyte, resembling the Gorilla somewhat in its skeleton, and although smaller than the male, still quite, if not more, man-shaped.

The London Zoological Society own a fine example of the Bald-headed Chimpanzee (*Anthropopithecus calvus*), which, under the name of "Sally," is known to every frequenter of their famous Gardens, where it has resided since October, 1883.

THE KOOLO-KAMBA.*

This kind of Troglodyte is celebrated for saying koola-koolo over and over again as its favourite cry, for having a very extraordinary frog-like figure, and for being one of those creatures which are exceedingly interesting to zoologists, because they are, as it were, half one thing and half another.

A neighbour of the great Apes already noticed, it associates also with the common Chimpanzee, in the quiet forests of Western Equatorial Africa. In one of these Du Chaillu first saw it, and he describes his discovery as follows:—

"We had hardly got clear of the Bashikoway ants and their bites when my ears were saluted by

* *Troglodytes Koolo-Kamba* (Du Chaillu); *Troglodytes Aubryi* (Gratiolet and Alix).

the singular cry of the Ape I was after. 'Koola-koolo! koola-koolo!'* it said several times. Gambo and I raised our eyes, and saw, high up on a tree-branch, a large Ape. We both fired at once, and the next moment the poor beast fell to the ground with a heavy crash. I rushed up, anxious to see if, indeed, I had a new animal. I saw in a moment that it was neither a Nschiego Mbouvé, nor a Chimpanzee, nor a Gorilla. Again I had a happy day—marked for ever with red ink in my calendar. We at once disembowelled the animal, which was a male. I found in its intestines only vegetable matter and remains. The skin and skeleton were taken into camp, where I cured the former with arsenic sufficiently to take it into Obindji. The animal was a full-grown male, four feet three inches high, and was less powerfully built than the male Gorilla, but as powerful as either the Chimpanzee or Nschiego Mbouvé. When it was brought into Obindji, all the people, and even Quenqueza, at once exclaimed, 'That is a Koolo-Kamba.' Then I asked them about the other Apes I already knew, but for these they had other names, and did not at all confound the species. For all these reasons I was assured that my prize was indeed a new animal; a variety, at least, of those before known. The Koolo-Kamba has several distinctive marks: a very round head, whiskers running quite round the face and below the chin; the face is round, the cheek-bones prominent, the eyes sunken, and the jaws not very prominent, less so than in any of the Apes. The hair is black and long on the arm, which was, however, partly bare. The Koolo is the Ape, of all the great Apes now known, which most nearly approaches man in the structure of its head; for the capacity of the cranium is somewhat greater, in proportion to the animal's size, than in either the Gorilla or the Nschiego Mbouvé. Of its habits these people could tell me nothing, except that farther in the interior it was found more frequently, and that it was like the Gorilla, very shy and hard of approach." They are rare animals, and Du Chaillu met with this one only; it was as large as a female Gorilla, and from its structure was evidently a great climber.

One was killed and sent over to Paris several years since, and its anatomy forms a great treatise by the distinguished men whose names are appended to its title, *Troglodytes Aubryi*.

They agree with Du Chaillu in his slight notice of its shape and peculiarities to a certain extent, and in his notice that the arms reach below the knee, that the shoulders are broad, and that the ears are large, but they give some very interesting descriptions of its strange characteristics. It has many points of resemblance with the Gorilla and many with the Nschiego, but it has others which cause it to be like the common Chimpanzee, and which show some likeness to the great Baboon. It fills up the gap in the animal scale between the Nschiego and Gorilla on the one hand, and the true Chimpanzee (*Troglodytes niger*) on the other; and were it not in existence, it would be necessary to divide these Apes into two groups or genera, to make, in fact, a genus Gorilla and a genus Troglodytes, the first to contain the Gorilla and Nschiego, and the last the Chimpanzee. They are all therefore linked together in one genus by it, that of *Troglodytes*.

The shape and the peculiar anatomy of the Koolo-Kamba are not simply curious and only interesting to those who study dry bones, for they have to do with its habits and mode of life, and their examination is full of instruction to those who like to understand causes and effects, and design in Nature. Much has been explained in the chapter on the Gorilla regarding the different parts of the body, and if that information is considered there will be no difficulty in comprehending all about the Ape now under consideration.

The shape of the body as a whole is admirably adapted for great powers of climbing and of exertion of the limbs, and these last are adapted for the same end in a manner surpassing the great Apes already described. But, moreover, the body is peculiarly suited, not for maintaining or often using the upright position or the legs, but for going on all-fours, like a Baboon or Dog. Doubtless the Gorilla and the Nschiego do often stand up for a short time, and their construction points at this being very possible, as their frame has a combination of structures for doing this and for climbing. Now the Koolo-Kamba must differ from them in its structure, for it requires those which enable it to invariably go on all-fours, and yet to climb better than the others.

It never wants to sit down, except with its knees drawn up to its nose, and it squats on its haunch-bones (the tuberosities of the haunch—of the "*ischium*" bone).

* Koolo is the cry, and Kambe means "to say."

The body is very ball-like, and there is no visible division between the chest, the stomach, and the hips; it is not troubled with a waist, and anything like one is positively below the hips, just over where the thighs join the body. In fact, as before noticed, the shape is that of a frog. There are no graceful curves to the back, and there is no "small" to it. On looking at the chest, it will be noticed that it is long behind and short in front; the ribs go down close to the edge of the hips; and in order that this extra stoutness and strength of loin shall be there, there are fourteen ribs, instead of thirteen, as in the other great Apes. The breast-bone in front sticks out, so that were the animal to lie on its stomach its point would lean on the ground, and not its front, as in us. This last peculiarity is an adaptation for going on all-fours. The absence of waist and the shape of the loins relate to the small size of one of the muscles of the back (sacro lumbalis), large and important in man.

KOOLO-KAMBA.

The belly is very large, and it is kept from pushing into the chest by the capacity given to the space within the ribs and breast-bone, by a bulged-out state of the ribs at the back, and the projection of the breast-bone. Hence, the frog-like figure looks asthmatical; and as it is very high-shouldered, there is but little neck.

All this bulging has not only reference to the maintenance of the capacity of the lungs, and its independence of the great stomach, which, when full, would tend to press in all directions, but it enables the muscles of the back and shoulders, which have so much to do with climbing, to be large and vigorous. More space is afforded for the insertion or attachment of muscular fibres.

The blade-bone does not add to the bulk of the shoulders, for it is rather long and narrow for a great Ape; and its spine, which has so much to do with the muscles which lift up the arm, is very much aslant, and in the best direction for constant climbing, instead of much walking on the knuckles. And that climbing and holding on are the usual motions may be credited, it is only necessary to notice that the arms and the fingers are long, and that the tips of them touch below the

knee when the skeleton is placed upright. Moreover, this great length is accompanied by corresponding strength, and also by a very curious condition of the hands.

The Koolo has a larger hand in relation to its breadth than the Gorilla, and there are no bunches of muscle forming rounded swellings or balls under the thumb and little finger. On the contrary, the long and narrow palm is, as it were, bent across, as if it could fit capitally on to a bough. There is no doubt that this Ape, like all the others, does a good deal of swinging, by holding on to boughs with its hands, when the arms are straight above the head; and that they move along a bough, or from tree to tree, in this position, without bending the elbow, and with considerable speed. This method of getting along may also be seen in Chimpanzees. Evidently the curved palm will be of immense advantage in such actions, and especially when it is combined, as it is in the Koolo-Kamba, with a slightly bent-downwards condition of the fingers. The bones (phalanges) of the fingers are long, and each is slightly curved, and not straight, as in man and the great Apes already noticed, so that their three bones, when in their proper position, are decidedly out of a straight line, and present a general curve, which is rendered all the more decided by the bend in the palm. All this is very useful for grasping and holding on. But it is not all; in man and the other great Apes, the wrist consists of two rows of small bones, one placed before the other: the first row is jointed to the bones of the fore-arm, at what is called the wrist-joint, which moves forwards and backwards as a hinge; and the second row is so jointed on the first row that there is no movement, and in front it is jointed to the bones of the palm, and to those of the thumb. Now in the Koolo the second row of wrist-bones —or as they are called from the Latin, *carpus*, a wrist—carpal bones *are movable* on the first row, and muscular exertion can bend, not only the metacarpal bones and the fingers, but also the wrist-bones. Hence the hand is more movable in the bending direction than that of man, and the reason is because of the peculiar requirements of the creature's life. The thumb is small, and only reaches the first joint of the forefinger: its tip can only touch the tip of one finger at a time, and not those of all, as in man, and therefore it is not of much use in distinguishing objects by touch; moreover, it cannot be stuck out far—and this is necessary, for in climbing its tip is required to be as close to the fingers as is possible. The muscles of the hands and arms resemble those of the Chimpanzee generally, and will be noticed in describing it.

When the Koolo-Kamba walks, it does so like the Gorilla, by leaning on the backs of its fingers, and hence it has callous pads on the back of their second bones. All the peculiar construction of the hands and wrist bears a relation to the vast muscular development of the muscles of the back of the chest and shoulders in the process of climbing; and it is to be observed, as it was in the instance of the Gorilla, that these muscles have more to do with such actions than those of the chest, which go to the arm, and which are so much used in man for that purpose. The muscles of the chest are not large and strong in the Apes, for, as has already been mentioned, they climb with the back of the hand towards the face, and do not attempt, like man, to lift the body with the palm and nails turned towards him. This last proceeding necessitates large chest muscles, and the former large ones at the back of the shoulders.

There is something remarkable about the haunch-bones, or those parts of them which support the body when sitting. In man they are well in front of the end of the back-bone, which tapers off and turns in a little, and forms a rudiment of a tail. These tuberosities of the haunch-bone (as they are called, because they are swollen out and flattened for the especial purpose in man) are placed, in the Koolo-Kamba, behind the end of the spine or the true rudiment of the tail, and this throws all the under parts backwards, giving the animal a thorough Baboon and animal character. Oddly enough, the rudiment of the tail in this Ape is smaller than in man.

A study of the foot shows that it is of immense use in holding on and in climbing, and of none in walking. It looks more like a small hand, furnished with a great thumb, than a foot with a toe-thumb.

It differs from human feet in the length of the toes, and this is rather an interesting artistic point, for there is some diversity in the opinions regarding which should be the longest toes in man.

The Greek statues—those grand models of the highest types of mankind—very constantly have the second toe the longest, and reaching more to the front, when the foot is on the ground, than the great toe and the third. Nowadays, after men have had their feet pinched, cabined, and confined in all sorts of boots and shoes, generation after generation, it is wonderful that their toes should be of any shape at

all; and, therefore, it must be anticipated that the Grecian type will not always prevail. Nevertheless, although the great toe is often the longest, the third toe never is, except there is some decided deformity, like double toes. It is, however, the third toe which is the longest in the Ape, just as the third finger of the hand is the longest in man; and hence the Ape's foot, with its great thumb, is in this hand-like. But as has been mentioned before, bone for bone, and almost muscle for muscle, the human and Ape's foot agree, and the hinder extremity of this last is really a foot with a toe-thumb.

On looking at the head of the Koolo, one is struck with the great ears, which are larger than those of the Apes already described, and almost as large as, but less detached, than those of the Chimpanzee. The skull is globular, and with a low contracted forehead receding behind the brow crests; but there are only faint ridges on its sides, although the muscles of the jaw are large, and they come from the sides of the skull. The head is very hairy, and the face, which is very prognathous (Greek, *gnathos*, jaw or mouth), or projecting in front, is black. It is rendered very tigerish and ugly by the flat nose merging into a wide, thick, projecting upper lip, without any furrow; and the mouth looks like a wide slit, there being no chin, on account of the pouting nature of the great lips.

Like the other Troglodytes, the Koolo-Kamba has great air sacs or throat pouches, which are hidden amongst the great muscles of the neck, and enter the organ of voice, or the larynx, between the upper and lower structures for the production of vocal sound. Their size and general nature may be satisfactorily compared with those of the Gorilla. (See page 22.)

Having something of a voice, this Ape has a better-formed palate than the others, and its tongue has not such a jumble of papillæ or little needle points on it as they have, for the larger cup-shaped ones are arranged at the back in the shape of the letter Y. The last molar tooth of the lower jaw has five cusps.

A huge eater of vegetable food, it requires a large stomach, and this has the two openings very close together, that is to say, the one for the passage of food in, and the other for the passage of food out, into the small gut. There is, as in all vegetarians by nature, a large great intestine, enormous, in fact, and this ends, as in man, in a blind gut with an appendix. The cause of all this is that vegetable food does not contain much available nourishment, and large portions of it must come in contact with the mucous or absorbing membrane of the stomach and bowels, in order that a proper quantity of nutritious matter may be absorbed, and be made into blood. The contrary is the case in flesh-eating animals, whose food contains a high percentage of nourishment; for in them the stomach and intestines are small, the surface required not being great, and nature is wonderfully economical.

THE SOKO.

This animal, both as regards its name, description, and habits, we owe to Livingstone; and the stories which he heard of it from the natives, in the strange country to the west of the great lake Tanganyika, must have wiled away many a weary hour during his ill-health and gradual loss of energy.

The first notice of it is curious, and occurs in his "Last Journals." They were in want of rain, and he writes:—"A Soko, alive, was believed to be a good charm for rain, so one was caught; and the captor had the ends of two fingers and toes bitten off. The Soko, or Gorilla, always tries to bite off these parts, and has been known to overpower a young man, and leave him without the ends of fingers and toes. I saw the nest of one; it was a poor contrivance—no more architectural skill shown than in the nest of our cushat dove." Here the consideration of this creature might have ended, for Livingstone terms it a Gorilla, but this name, like that of Pongo, is evidently given to all great African Apes with bad characters, and moreover, as will be noticed presently, when one of the illustrious traveller's native companions came to England, and was shown a stuffed Gorilla, he decided that it was not the same thing as the Soko.

In another part of his Journal Livingstone returns to the Soko, which he still calls the Gorilla; but in the drawings given it evidently is not one, and is neither as large in its body nor as ugly in the face; moreover, the large ears would cause it to be considered, were there not other reasons, as one of the true Chimpanzees, or *Troglodytes niger*.

The following extracts from Livingstone possess undoubted interest:—

"24th August.—Four Gorillas or Sokos were killed yesterday; an extensive grass-burning forced them out of their usual haunt, and coming on the plain they were speared. They often go erect,

but place the hand on the head, as if to steady the body. When seen thus the Soko is an ungainly beast. The most sentimental young lady would not call him a 'dear,' but a bandy-legged, pot-bellied, low-looking villain, without a particle of the gentleman in him. Other animals, especially the Antelopes, are graceful, and it is pleasant to see them, either at rest or in motion; the natives also are well made, lithe and comely to behold; but the Soko, if large, would do well to stand for a picture of the devil. He takes away my appetite by his disgusting bestiality of appearance. His light yellow face shows off his ugly whiskers and faint apology for a beard; the forehead, villainously low, with high ears, is well in the background of the great dog-mouth; the teeth are slightly human, but the canines show the beast by their large development. The hands, or rather the fingers, are like those of the natives. The flesh of the feet is yellow; and the eagerness with which the Manyuema devour it, leaves the

PORTRAIT OF A YOUNG SOKO. (*Copied by permission from the Engraving in Livingstone's "Last Journal."*)

impression that eating Sokos was the first stage by which they arrived at being cannibals; they say the flesh is delicious. The Soko is represented by some to be extremely knowing, successfully stalking men and women while at their work; kidnapping children, and running up trees with them, he seems to be amused by the sight of the young native in his arms, but comes down when tempted by a bunch of bananas, and as he lifts that, drops the child; the young Soko, in such a case, would cling closely to the armpit of the elder. One man was cutting out honey from a tree, and naked, when a Soko suddenly appeared and caught him, then let him go; another man was hunting, and missed in his attempt to stab a Soko; it seized the spear, and broke it, then grappled with the man, who called to his companions, 'Soko has caught me!' The Soko bit off the ends of his fingers, and escaped unharmed. Both men are now alive at Bambarré."

"The Soko is so cunning, and has such sharp eyes, that no one can stalk him in front without being seen; hence, when shot, it is always in the back; when surrounded by men and nets, he is generally speared in the back too, otherwise he is not a very formidable beast. He is nothing, as compared in power of damaging his assailant, to a Leopard or Lion, but is more like a man unarmed, for it does not

occur to him to use his canine teeth, which are long and formidable. Numbers of them came down in the forest, within a hundred yards of our camp, and would be unknown but for giving tongue like Fox-hounds: this is their nearest approach to speech. A man, hoeing, was stalked by a Soko, and seized; he roared out, but the Soko giggled and grinned, and left him as if he had done it in play. A child, caught up by a Soko, is often abused by being pinched, and scratched, and let fall."

"The Soko kills the Leopard occasionally, by seizing both paws and biting them, so as to disable them; he then goes up a tree, groans over his wounds, and sometimes recovers, while the Leopard dies. At other times both Soko and Leopard die. The Lion kills him at once, and sometimes tears his limbs

SOKO HUNT. (*After a Sketch by Dr. Livingstone.*)

off, but does not eat him. The Soko eats no flesh; small bananas are his dainties, but not maize. His food consists of wild fruits, which abound, and of these one is like large sweet sop, but indifferent in taste. The Soko brings forth at times twins. A very large Soko was seen by Mohamad's hunters, sitting picking his nails; they tried to stalk him, but he vanished. Some Manyuema think that their buried dead rise as Sokos, and one was killed with holes in his ears, as if he had been a man. He is very strong, and fears guns, but not spears. He never catches women."

"Sokos collect together, and make a drumming noise, some say with hollow trees, then burst forth into loud yells, which are well imitated by the natives' embryonic music. If a man has no spear, the Soko goes away satisfied; but if wounded, he seizes the wrist, lops off the fingers and spits them out, slaps the cheeks of his victim, and bites without breaking the skin; he draws out a spear (but never uses it), and takes some leaves and stuffs them into his wound to staunch the blood; he does not seek an encounter with an armed man. He sees women do him no harm, and never molests them; a man

without a spear is nearly safe from him. Manyuema say, 'Soko is a man, and nothing bad in him.' They live in communities of about ten, each having his own female; an intruder from another camp is beaten off with their fists and loud yells. If one tries to seize the female of another, he is caught on the ground, and all unite in boxing and biting the offender. A male often carries a child, especially if they are passing from one patch of forest to another over a grassy space; he then gives it to the mother."

The "Last Journals" contains a portrait of a young Soko (reproduced on page 47), which shows a short-armed, weak-legged, long-eared creature; and in the engraving on page 48, the adults which are being hunted are certainly very much shorter than the natives who are killing them. All that can be said, then, is that possibly the Soko is a kind of Troglodyte, greatly resembling the kind we have next to notice; but its geographical range is most interesting. Its being found so many

CHIMPANZEE. *(From a Sketch by Wolf, in the possession of the Zoological Society.)*

hundreds of miles from the Sierra del Crystal, and beyond the woods of the coast-living Chimpanzees, would appear to prove that formerly there were forest and jungle far away to the east, where there are now plains, rivers, and lakes with much forest land.

THE TRUE CHIMPANZEE.*

The name Chimpanzee has sometimes been given to all the great Apes just described, but reference has been made, in considering some points in their anatomy and habits, to a particular animal which bears this name. This one comes next to them in the descending order of the scale of beings, and completes the number of the kinds of these man-shaped Apes of Equatorial Africa. It is the animal, the young of which have frequently been brought to England, where they have been celebrated for their gentle fun, romping play, good climbing, and their ability to imitate many human habits—clothes-wearing, tobacco-smoking, and tea-drinking especially. It is the Chimpanzee of Chimpanzees, the young

* *Troglodytes niger.*

of which have such very human-looking faces and most baby-like skulls. Being covered for the most part, and especially on the top and sides of the head, with long black hairs, it is called the Black Chimpanzee, or *Troglodytes niger*.

It was a sight worth seeing to be present in the Monkey House of the Zoological Gardens, in London, when the keeper paid an early morning visit to his attached friend, the Chimpanzee. If he was not quite awake, or lazily inclined, and snugly covered up in his little wooden house, and the keeper called him, a commotion was heard inside, and then a round little figure with a large head came tumbling out, and rushed to the iron wicket. He creeps along at a great rate on all-fours, but the body is half erect, for the fore limbs are long, and the knuckles, or rather the back parts of the second joints of the fingers, are allowed to touch the ground and support the frame in front, whilst the elbows are kept straight. The hind legs, being short, move one after the other as in a canter, and it is readily noticed that although the feet touch the ground on their outer edges they can rest flat on the soles.

There is much joyful recognition, and after he has put his arms around the keeper's neck, he enjoys being tickled and laid on his back in the straw. Making grunts and little laughs, he shows his fine set of teeth, and his fine hazel-coloured eyes twinkle with fun. Then he rushes off, tumbling head over heels, scampers over the straw, and with a jump clasps one of the horizontal wooden bars in the cage, and swings himself up and on to it with an ease and grace which many a gymnast might envy. Running along this, and just balancing himself with the assistance of the back of his hand, he nears a rope, and then, after seizing it, swings with arms out at full length, now catching hold of others or of the wire lattice-work with his feet and toe-thumb, or suddenly coming to the ground with a great bounce. This is usually preparatory to coming to the spectators, and he then squats down, folds his arms, and moves his shoulders from side to side in a quick and restless manner. Another scamper brings him to his house on the ground-floor, into which he looks, and then taking a lot of biscuit, he gives a jump on to its shelving top, sits down, and begins to eat. He sits upright enough, and puts the biscuit into his mouth, but rather clumsily. He does not take it between the tips of his fingers and the thumb, but between the thumb and the side of the first finger, for the thumb is short. Hence, as the food disappears, he appears to be cramming the knuckle of his first finger into his mouth. *

One is struck with the colour of the face, which is nearly hairless, for the tint of its skin is a dirty yellow-ochre; but it is relieved by the beautiful white teeth, the hazel eyes, and the long hair which comes down from the top of the head in front of the ear like a lock. The upper lip has no furrow running down from the small and flat nose, but it is very large, and the mouth looks like a slit in the face when both lips are together. He has distinct eyelids; and when he sits and looks forwards, the chin reaches below the top of the breast and hides the neck. The palm of the hands is flesh-coloured, or darker, and the foot looks very strange, for the hair is long over the ankle and very black, and it ceases suddenly, so that the heel and all the sides and the sole are naked and flesh-tinted. The absence of hair on the face—there being a little straggling beard only—is possibly an ornament, and it is noticed in many Monkeys; but its absence from the under part of the hand and foot, of course, is of use, for it gives a greater power of grasp and a finer sense of touch. The front hair comes to a peak over the forehead, and the curve on either side is as graceful as that of a Queen's Counsel's wig; then it covers a broad low head, which looks very big behind and decidedly over-burdened with two great ears, larger than those of the Gorilla, and which are close neighbours to the high shoulders. Long black hair, with the ears peering through, covers all the back and sides of the head and the wide shoulders and very short neck, and is continued down the back, which shows no sign of a waist, and only becomes smaller just above the thighs. Here, then, is another instance of the frog-like body shape, and it is produced by the same general internal arrangements which have been noticed in the great Apes already described. That is to say, large lungs, and a great stomach and digestive apparatus, are more important than a slim and elegant figure; and good short back-bones, and at least thirteen ribs on each side are more satisfactory possessions in an African forest than long bones and a weak spine.

The arm, fore-arm, and fingers, as a limb, are long, and the tips of the fingers reach just below the knee. This is consistent with the scheme of the construction of the animal, and its adaptation

* This interesting animal died in 1876.

for the forest life, which requires the ability to move rapidly and also to climb very easily. The arms are in constant movement when the Chimpanzee is walking, and if they are not assisting in the motion they are uplifted, the head being, moreover, carried a little forward with regard to the body. When the hands clasp a cross-bar, the little use of the small thumb is readily noticed, and the body is allowed to swing, as it were, at the full length of the arms, the thumb not assisting in holding on. But when it climbs a pole, it grasps just like a man under the same circumstances, and the thumb partly encircles the wood. It is very curious to feel the grasp of the hand, and the vigorous squeeze that the foot can give, and to look at the palms and soles. The palms seem very wrinkled across, but not to have a ball under the thumb of any size, and they seem narrow for their length. But although this is the case, and the thumb is short, they assist in grasping very forcibly. All the fingers and the thumbs have flat nails on them, which do not approach the character of a claw, and corresponding nails are found on the feet. All the heel is naked, as if it came through a hole in a stocking of black hair; and as a whole, the foot is shorter than the hand, the third toe being the longest. The toe-thumb is easily movable, and assists in climbing, for it grasps with the aid of the other toes very readily. Like the other large Apes already mentioned, it has no calf, and the legs seem to be too small for it, and to be stuck on to the body by small hips. The roundness behind is wanting, and therefore the muscles which particularly assist in the erect position are not large, as in man.

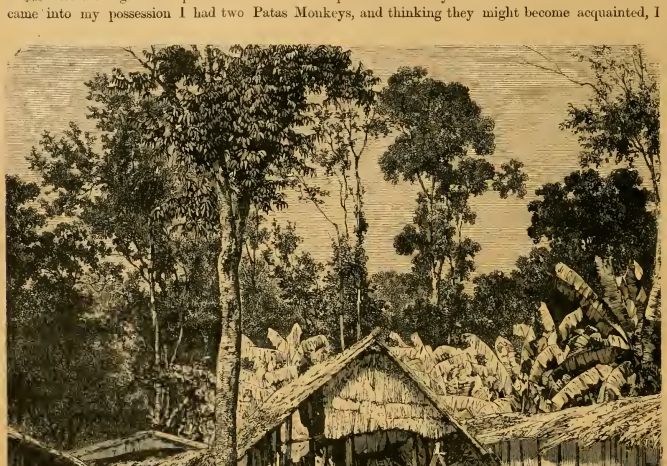
Yet at first sight there is something very human about the Chimpanzee; it looks like a very old child, and doubtless this is increased by its gentle habits and amiability; and there is every apology to be made for the early geographers and anatomists, who called it the "Pigmie."

One of the first living Chimpanzees which was brought to England took strange dislikes to people. When it was brought on board the ship it would give its hand to be shaken by some, but refused it to others of the sailors with marks of anger, and it speedily became very familiar with the crew, except with a boy, to whom it never became reconciled. When the seamen's mess was brought on deck, it was a constant attendant; it would go round and embrace each person, while it uttered loud yells, and then seated itself to enjoy the repast. If it was pleased at any favourite morsel, or if a piece of sweetmeat was given to it, satisfaction was expressed by a sound like a "hem," in a grave tone; but if it was made angry or vexed, it would bark like a dog or cry like a child, and scratch itself most vehemently. It was active and cheerful in warm latitudes, but it became languid as it left the Torrid Zone, so that a blanket had to be given it as the English Channel was reached.

Bamboo, a Chimpanzee, once in the Zoological Society's Gardens, Regent's Park, and the subject of the following sketch, by Lieut. Sayers, "was purchased from a Mandingo, at Sierra Leone, who related that he had captured him in the Bullom country some months before, having first shot the mother, on which occasions the young ones never fail to remain by their wounded parents. On becoming mine, he was delivered over to a black boy, my servant, and in a few days became so attached to him as to be exceedingly troublesome, screaming and throwing himself into the most violent passion if he attempted to leave him for a moment. He evinced also a most strange affection for clothes, never omitting an opportunity of possessing himself of the first garment he came across, whenever he had the means of entering my apartment. He carried it immediately to the piazza, where invariably he seated himself on it with a self-satisfied grunt; nor would he resign it without a hard fight, and, on being worsted, exhibited every symptom of the greatest anger. Observing this strange fancy, I procured him a piece of cotton cloth, which, much to the amusement of all who saw him, he was never without, carrying it with him wherever he went, nor could any temptation induce him to resign it even for a moment. Totally unacquainted with their mode of living in the wild state, I adopted the following method of feeding him, which has appeared to succeed admirably. In the morning, at eight o'clock, he received a piece of bread, about the size of a halfpenny loaf, steeped in water or milk and water; about two, a couple of bananas or plantains; and before he retired for the night, a banana, orange, or slice of pine-apple. The banana appeared to be his favourite fruit; for it he would forsake all other viands, and if not gratified, would exhibit the utmost petulance. On one occasion I deemed it necessary to refuse him one, considering that he had already eaten a sufficiency, upon which he threw himself into the most violent passion, and uttering a piercing cry, knocked his head with such violence against the wall as to throw himself on his back, then ascending a chest which was near, wildly threw his

arms into the air and precipitated himself from it. These actions so alarmed me for his safety that I gave up the contest, and on doing so he evinced the greatest satisfaction at his victory, uttering for several minutes the most expressive grunts and cries; in short, he exhibited, on all occasions when his will was opposed, the impatient temper of a spoilt child; but even in the height of passion I never observed any disposition to bite or otherwise ill-treat his keeper or myself.

"Although he would never object to be caressed or nursed by even a stranger, yet I never saw him evince the slightest disposition to make the acquaintance of any other animal. At the time he came into my possession I had two Patas Monkeys, and thinking they might become acquainted, I



VILLAGE IN THE GABOON COUNTRY.

placed Mr. Bamboo in the same apartment, where he resided for five months, yet I never saw the least desire on his part to become even friendly; on the contrary, he showed evident anger and dislike at their approach. This strange attachment to the human race, and manifest dislike to all others, I have always considered one of the most extraordinary features of this genus. His cunning was also remarkable. On all occasions when he thought he was unobserved, he would not fail to steal everything within his reach, for no other apparent purpose than to gratify a propensity for thieving; did he, however, even think you were looking at him, he would wait his opportunity with the greatest patience before he commenced depredation. In his habits, unlike the Monkey tribe, he was exceedingly cleanly, never soiling his bed or any place near it; and even on board ship (during the warm weather) he never failed to seek the deck, unassisted, whenever the calls of nature required it. On being left by himself in his piazza he would invariably seat himself on the window-sill, which was the highest point he could

SICK ORANG-UTAN.

attain, and commanded a view of the barrack-yard as well as the interior of my bed-room; but at sunset he would descend, enter a washing-tub, which he had of his own accord chosen as a sleeping-place, and remain there all night; as soon, however, as the sun rose, he would never fail to occupy his favourite position on the window-ledge. From this, I should say, that trees are ascended by the Chimpanzee merely for observation or food, and that they live principally on the ground. Bamboo, at the time of purchase, appeared to be about fourteen months old, and from what I could learn from the natives, they do not reach their full growth till between nine and ten years of age; which, if true, brings them extremely near the human species, as the boy or girl of West Africa, at thirteen or fourteen years old, is quite as much a man or woman as those of nineteen or twenty in our more northern clime. Their height, when full grown, is said to be between four and five feet; indeed, I was credibly informed that a male Chimpanzee, which had been shot in the neighbourhood and brought into Free Town, measured four feet five inches in length, and was so heavy as to form a very fair load for two men, who carried him on a pole between them. The natives say that in their wild state their strength is enormous, and that they have seen them snap boughs off the trees with the greatest apparent ease, which the united strength of two men could scarcely bend. The Chimpanzee is, without doubt, to be found in all the countries, from the banks of the Gambia in the north to the kingdom of Congo in the south, as the natives of all the intermediate parts seem to be perfectly acquainted with them. From my own experience, I can state that the low shores of the Bullom country, situated on the northern shores of the river near Sierra Leone, are infested by them in numbers quite equal to the commonest species of Monkeys. I consider these animals to be gregarious; for when visiting the rice farms of the Chief Dalla Mohammadoo, on the Bullom shore, their cries plainly indicated the vicinity of a troop, as the noise heard could not have been produced by less than eight or ten of them. The natives also affirmed that they always travel in strong bodies, armed with sticks, which they use with much dexterity. They are exceedingly watchful; and the first one who discovers the approach of a stranger utters a protracted cry, much resembling that of a human being in the greatest distress. The first time I heard it I was much startled; the animal was apparently not more than thirty paces distant, but had it been but five I could not have seen it, from the tangled nature of the jungle, and I certainly conceived that such sounds could only have proceeded from a human being, who hoped to gain assistance by his cries from some terrible and instant death. The native who was with me laid his hand upon my shoulder, and pointing suspiciously to the bush, said, 'Massa, Baboo live there!' and in a few minutes the wood appeared alive with them, their cries resembling the barking of dogs. My guide informed me that the cry first heard was to inform the troop of my approach, and that they would all immediately leave the trees, or any exalted situation that might expose them to view, and seek the bush; he also showed evident fear, and entreated me not to proceed any further in that direction. The plantations of bananas, pampaws, and plantains, which the natives usually intermix with their rice, constituting the favourite food of the Chimpanzee, account for their being so frequent in the neighbourhood of rice fields. The difficulty of procuring live specimens of this genus arises principally, I should say, from the superstitions of the natives concerning them, who believe they possess the power of 'witching.'"

A most interesting little male Chimpanzee was obtained from the natives of the Gambia coast some years since, and became famous in London for its great intelligence and human-like conduct. His mother was shot when he was about a twelvemonth old, about 120 miles from the sea; and after being well taken care of he was sent to England on board ship, where he had a free range of the rigging and decks, and where he made himself much liked. A distinguished zoologist, Mr. Broderip, visited him in the Zoological Gardens after he had undergone some tuition, and describes what he saw as follows:—

"I saw him for the first time in the kitchen belonging to the keepers' apartments, dressed in a little Guernsey shirt, or banyan jacket. He was sitting child-like in the lap of a good old woman, to whom he clung whenever she made show of putting him down. His aspect was mild and passive, but that of a little withered old man, and his large eyes, hairless and crimpled visage, and man-like ears, surmounted by the black hair of his head, rendered the resemblance very striking, notwithstanding the depressed nose and the projecting mouth. He had already become very fond of his good old nurse, and she had evidently become attached to her nursling, although they had only been acquainted for three or four days, and it was with difficulty that he permitted her to go away to do her work in

another part of the building. On her lap he was perfectly at his ease, and it seemed to me that he considered her as occupying the place of his mother. He was constantly reaching up with his hand to the fold of her neckerchief, though when he did so she checked him, saying, 'No, Tommy, you must not pull the pin out.' When not otherwise occupied, he would sit quietly in her lap, pulling his toes about with his fingers, with the same passive air as a human child exhibits when amusing himself in the same manner. I wished to examine his teeth; and when his nurse, in order to make him open his mouth, threw him back in her arm and tickled him just as she would a child, the caricature was complete.

"I offered him my ungloved hand. He took it mildly in his, with a manner equally exempt from forwardness and fear, examined it with his eyes, and perceiving a ring on one of my fingers, submitted that, and that only, to a very cautious and gentle examination with his teeth, so as not to leave any mark on the ring. I then offered him my other hand with the glove on. This he felt, looked at it, turned it about, and then tried it with his teeth. At length it became necessary for his kind nurse to leave him, and after much remonstrance on his part she put him on the floor. He would not leave her, however, and walked nearly erect by her side, holding by her gown just like a child. At last she got him away by offering him a peeled raw potato, which he ate with great relish, holding it in his right hand. His keeper, who is very attentive to him, then made his appearance, and spoke to him. Tommy evidently made an attempt to speak, gesticulating as he stood erect, protruding his lips, and making a hoarse noise like 'hoo! hoo!' He soon showed a disposition to play with me, jumping on his lower extremities opposite to me like a child, and looking at me with an expression indicating a wish for a game at romps. I confess I complied, and a capital game we had. On another occasion, and when he had become familiar with me, I caused, in the midst of his play, a looking-glass to be brought and held before him. His attention was constantly and strongly arrested: from the utmost activity he became immovably fixed, steadfastly gazing at the mirror with eagerness, and something like wonder depicted in his face. He at length looked up at me, then again gazed at the glass. The tips of my fingers appeared on one side as I held it; he put his hands and then his lips to them, then looked behind the glass, and finally passed his hands behind it, evidently to feel if there were anything substantial there. I presented him with a cocoa-nut, to the shell of which some bark was still adhering; the tender bud was just beginning to shoot forth—this he immediately bit off and ate. He then stripped off some of the bark with his teeth, moving it by the crust of adhering fibres round his head, darted it down, and repeatedly jumped on it with all his weight. A hole was bored in one of the eyes, and the nut again given to him, and he immediately held it up with the aperture downwards, applied his mouth to it, and sucked away at what milk there was with great glee. As I was making notes with a paper and pencil, he came up and looked at me inquisitively, testing the pencil with his teeth when he had it given to him. A trial was made of the little fellow's courage; for when his attention was directed elsewhere, a hamper containing a large snake, called Python, was brought in and placed on a chair near the dresser. The lid was raised, and the basket in which the snake was enveloped was opened, and soon after Tommy came gambolling that way. As he jumped and danced along the dresser towards the basket he was all gaiety and life; suddenly he seemed to be taken aback, stopped, and cautiously advanced towards the basket, peered or rather craned over it, and constantly, with a gesture of horror and aversion and the cry of 'hoo! hoo!' recoiled from the detested object, jumped back as far as he could, and then sprang to his keeper for protection. Tommy does not like confinement, and when he is shut up in his cage, the violence with which he pulls at and shakes the door is very great, and shows considerable strength; but I have never seen him use this exertion against any other part of the cage, though his keeper has endeavoured to induce him to do so, in order to see whether he would make the distinction. When at liberty he is extremely playful; and in his high jinks, I saw him toddle into a corner where an unlucky bitch was lying with a litter of very young pups, and lay hold of one of them, till the snarling of the mother and the cries of the keeper made him put the pup down. He then climbed up to the top of the cage where the Marmosets were, and jumped furiously upon it, evidently to astonish the inmates, who huddled together, looking up at the dreadful creature over their heads. Then he went to a window, opened it and looked out. I was afraid that he might make his escape; but the words 'Tommy, No!' pronounced by the keeper in a mild but firm tone, caused him to shut the window and to come away. He is, in truth, a most docile

and affectionate animal, and it is impossible not to be taken with the expressive gestures and looks with which he courts your good opinion, and throws himself upon you for protection against annoyance."

Whether they grow cross and savage as they get old is not known, for no adults have been kept in captivity, but as this is usual in other Monkeys, it is probable that their interesting time of life is that of childhood, and that when the age of fun and tricks has passed there is not much else but brutality left.

Little or nothing reliable is known about the habits of the adults, and all the wickednesses of Gorillas and Baboons have been attributed to them, and, in fact, the very same stories will do for any one of them.

These stories have, however, been believed; and even Cuvier, the great comparative anatomist, wrote, that the Chimpanzees live in troops, construct themselves huts of leaves, arm themselves with sticks and stones, and employ these weapons to drive away men and Elephants from their dwellings. They did not, he believed, scruple to attack the Lion, and they were exceedingly impolite to negresses in general.

As they all, except possibly the Soko, live in a district where the forests are dense and close, there is no doubt they are rarely seen; and indeed reliable travellers do not hesitate to say that a white man has never seen them in a state of nature, except by obtaining a glance as they rush off on being surprised. All the stories must, therefore, be received with suspicion, as tainted with the results of African fear and love of the wonderful; especially as they come from the negro race living in the remarkable tract of country extending along the West Coast from the river Gambia to some distance north of Angola, and thence into the interior to the little known regions between the hills which run parallel with the sea many miles inland, and the country of the large lakes far away to the East.

Gifted with wonderful agility and no little power of imitation and intelligence, and possessed of very acute senses and ability to unite the actions of many groups of muscles to a common purpose, the Chimpanzee must have a well-formed nervous system—that is to say, a good brain and spinal cord. A brain to originate or commence actions, and the cord of nerves to carry the orders of the brain to the limbs. Measured over the brain case of the skull, that of the Chimpanzee has a bulk of about one-half of that of man, and less than that of the Gorilla; but the brain itself has striking resemblances to that of man. The principal folds which are noticed on the human brain exist in the Chimpanzee, but they are simpler in their foldings, and are large in proportion to the whole. This means that there is not as much nerve structure packed in a given space as there is in man; and the distinction is most important, for the greater the packing the greater the nervous energy and power. But the parts of the brain which have especially to do with the movements of the body, and their regulations and adaptations, are very well formed; and it is the comparative deficiency in those parts which have a mysterious relation with the intelligence, instinct, and the mind which causes the brain of the Chimpanzee to differ in appearance and size from that of man. But in both the brain proper over-laps and covers the cerebellum or little brain. The nerves are well formed and large.

It seems that the brain of the Chimpanzee never has a chance of increasing in size, for after a certain age the bones of the brain case become, as it were, soldered together.

The Chimpanzee has a famous pair of shoulders, a broad back, and, like the Gorilla, a very short neck. Its weight is less than that of the greatest of Apes, and therefore it does not require such huge muscles for climbing. The great bony spines of the neck-bones are smaller; and the bones of the upper part of the spine are not made as strongly.

Loving much to hang by the hands, with the arms stretched out above the head, the Chimpanzee has the blade-bone more like that of an ordinary Monkey, and less like that of man and the Gorilla, and its muscles are so placed as to permit of their acting readily when this position is kept up. As this position is extremely easy and useful, it is assisted by the animal's having a short and stout collar-bone. Its arm-bone is tolerably near the length of that of man, but it is like a Gorilla's in miniature. The bones of the fore-arm (the radius and ulna), instead of being shorter than the arm-bone, equal it in length, and the last named is much bent, so as to give a large surface for the muscles which supply the hand and wrist.

As a whole, the hand of the Chimpanzee is, in proportion to the size of the animal, larger than

that of the Gorilla, but the thumb is shorter, and this makes it more Monkey-like than human; and the same may be said of the lower limbs, for the thigh-bone and those of the leg, although greatly resembling those of the Gorilla, have many peculiarities which make them resemble those of the less important Monkeys. Finally, with regard to the foot, that of the Chimpanzee is more Monkeyish than that of the Gorilla. The great Ape's foot has many peculiarities which make it differ from that of man, and these are all magnified, as it were, in the Chimpanzee, whose foot, therefore, is all the more unlike ours. It is especially adapted for grasping and climbing, and less well suited for occasionally standing erect and walking. Its heel is short and slender, and the toe-thumb is smaller, and the whole foot is slenderer, than the Gorilla's. Moreover, it is more turned in.

When young, there are no crests on the head, but with age a small one grows on each side in front, running from about the centre of each side of the brow ridge over the receding forehead, and joining together in the middle line, close to the top of the skull. This meets a larger and stronger one, which is a miniature of the head crest of the Gorilla, and which reaches from ear to ear. The use is probably for the attachment of the masticating muscles at the side, and for that of the muscles of the neck behind; but it is also a kind of ornament of the males.

Strong as this Ape is in its loins, from its extra ribs, the hip-bones seem narrow from side to side; and one of the causes of this is interesting, not only because it is also noticed in the other great Apes, but also because it is one of their marked distinctions from man.

BRAIN OF CHIMPANZEE.

The pieces of the back-bone (or vertebræ), as they pass between the hip-bones behind, unite them together, and degenerate until they form the curious little tail-end of the back-bone, which in us, and in the Apes, is curled slightly, with the concave part of the bend forward. The pieces unite strongly to each other above and below, and form really one bone, which is called the sacrum. Now, if these pieces were nearly or quite as stout and broad as those higher up, the hips would be wide apart; but if they become narrow, the hips will be all the closer together. In man, the pieces are broad, and the sacrum, as a whole, is so also, and the hips are widely separate; but the reverse is the case in the Apes.

This difference in the breadth of the bone and the width of the hip has evidently to do with the maintenance of the erect posture in man, and the inability to keep erect for long, and comfortably, by these great Apes. The larger the surface of the sacrum, the greater is the mass of muscle passing to the back and downwards; and this is small in comparison in the Chimpanzee.

Where the proper vertebræ of the sacrum end—that is to say, the pieces of the back-bone which are placed between the hip (ilium) bones—the tail begins. It is made up of three stunted bones, which are something like ill-made back-bone pieces (vertebræ); they are usually inseparably joined together to make a special bone, which is broad above, and tapering below. This bone, the rudiment of the tail, which, from some fancied resemblance to a Cuckoo's back, has been called the cuckoo-bone (*os coccygis*), is covered by skin and embedded in muscles, which do not allow it to stick out visibly even as a stump; for its tip is curled inwards. This apology for the member which is so vastly important in many Monkeys is narrow in the man-like Apes, the black Chimpanzee included; but it is a little wider in man, although the general construction is the same. Could these bones—which, by their being united, form this rudiment of a tail—be disunited and increased in number, stuck out, and covered with skin and muscles, something like the very Monkey-like appendage would be formed. But noble tails are not the gifts of the higher Apes, as they are called, from their many points of resemblance in structure with man, and even in the smaller Monkeys they are extremely variable belongings, being given to one kind and not to another in a manner far beyond our philosophy.

The Chimpanzee has a long palate, like the other great Apes of the West African woods.

Moreover, it has a uvula in the back of the throat, and the back of the tongue is marked with great papillæ, which take up the shape of a T. It does not do more than grunt "hem," and bark after a fashion; and the use of some great air-pouches, which resemble those of the Gorilla, are therefore not very apparent. But the bony structures of the palate are interesting, for at the back of it they do not form a simple knob, as in the Gorilla, but resemble those of man, and there is a little prominence, with a festoon curve on each side.

It lives upon vegetable food, and its teeth are admirably suited for it; they are of the same number as those of the rest of the great man-shaped Apes, and do not differ very much from them. The front teeth are large, and project, and do not bite very up and down on the tips, so they wear behind quicker than in front, their general shape being rather peculiar and distinctive. Female Chimpanzees have smaller eye-teeth than the males, and all have them with a sharp edge behind, so that they can cut a pine-apple as well as pierce it. Behind them are the pre- and true molars, but the last tooth of the upper jaw looks small, for its hinder projections or cusps are small. In the lower jaw the last tooth has a fifth cusp, but it is smaller proportionately than in the lower Monkeys; and the first pre-molar has its front and outer angle stuck out very much after the fashion of the Baboons. Now these are little matters, which do not appear to have anything to do with causes and effects, the adaptation of means to ends, or which do not enable the creature to chew and crush its food a bit the less w[illegible], or better than others; they refer to some hidden mystery which unites apparently very different animals together in the scheme of creation. Thus the Chimpanzee has human-like, Gorilla-like, Baboon-like, and other Monkey-like peculiarities, so far as the teeth are concerned, and yet which do not interfere with the successful mastication of the food. We may make theories about them of supreme interest, which may explain why animals are alike and unlike, and how the structures of superior animals were foreshadowed in those of lower ones, and the structures of the latter in those of still simpler forms of life.

It is the great front teeth, the large space hidden by the visible nose, the prominent upper, and the great length of the lower jaw, which give such a Baboon-like appearance to the face of the Chimpanzee's skull; and this is interesting, for there may have been a kinship between the two tribes.

These man-shaped Apes, the Gorilla, the Nschiego Mbouvé, the Koolo-Kamba, the Soko, and the Chimpanzee, form a group of beings which is peculiarly situated geographically, and which is separated from all others by anatomical differences. Their home is in Equatorial Africa, from the Western Sea to the Great Lakes near the eastern side of the Continent, and none of the kinds composing it have ever been found out of this range. Their bones have not been found in caves or in the state of fossils anywhere, so they must be regarded as essentially African. The group clings to forest and jungle, and its members lead very much the same kind of lives, for they are all vegetarians, liking quietude, and either roaming singly or in pairs, or living in troops. There is no evidence whatever that any of these species of Troglodytes have ever wandered; and it must be admitted that they have lived where they are now found ever since the country has been as it is, as regards its physical geography and peculiar climate. As regards their anatomical distinctness from other beings, they may be separated from man on the one hand, and from the Monkeys, which form the subject of the next chapters, on the other. They are linked together as a group by many resemblances in their construction, although there are differences enough to distinguish kind from kind. From man they one and all differ in the shape of the head, the size of the brain case, the nature of the palate, the shape of the jaws, and in the last lower molar teeth and tooth-spaces. Their head-ridges, the shape and length of their limbs, and the nature of their thumbs and toe-thumbs are very distinctive. The great air-pouches, the shape of the chest, the extra ribs, and the shape of the hip-girdle, cause them to differ much from man; and their brain is, as it were, dwarfed and infantile.*

* They have several muscular peculiarities. Thus the great muscle of the hind part of the loins (sacro lumbalis) is vast and fleshy in man, but it is reduced to very small proportions in the great Apes. The great oblique muscle of the body is not attached to the hip, and the muscles of the buttocks are reduced excessively in the Apes. All this renders their erect position difficult and not usual. The motions of the shoulder and arms are assisted by extra muscles; one stretches from the sixth neck-vertebra to the first rib, another reaches from the outer part of the collar-bone to the neck in front, to the bone under the tongue (hyoid bone), and a third from the collar-bone to the side of the first vertebra. The small muscle of the chest (pectoralis minor) reaches to the capsule which surrounds the shoulder-joint. There is an extra muscle, which

CHAPTER III.

THE MAN-SHAPED APES (*continued*)—Genus *Simia*—THE ORANG-UTAN.

Origin of the Name—Description of the Orang—Rajah Brooke's First Specimen—Mr. Wallace's Experiences in Mias Hunting—The Home of the Mias—A Mias at Bay—Their Nests, Habits, Food, and Localities—Different kinds of Orangs—Structural Points—The Intelligence and Habits of the Young—The Brain and its Case—Resemblances and Differences of Old and Young.

THE ORANG-UTAN.*

THE Malays call their chiefs Orangs, and the word relates to the intelligence of those called by it, meaning "a rational being." They apply it also to their Elephants, and to the great Ape of Sumatra and Borneo. Utan, or as some spell it, Oetan (utang being wrong), means wild, or "of the woods;" and hence the conjoined words may be translated by what the natives really mean, "the wild man of the wood." There are two kinds of Orang-utan, and both are, to a certain extent, man-like, the resemblance being greatest in the females and in the young, and diminishing as the males grow older.

All have long ruddy-brown hair, the tinge being decidedly red, a dark face, with small eyes, small nose, and great projecting jaws. The hair comes over the forehead and backwards over the neck; it is long on the limbs, and points downwards on the upper and upwards on the lower arm. It covers the back, and seat, and legs, standing out often, and gives a very wiry look to the fur. What strikes one directly on looking at a well-stuffed specimen of an old male, for instance, is the great length of the fore-limbs, which reach far towards the ankle, the length of the muzzle, and the extraordinary breadth of the face under the eyes, where the flatness resembles a mask more than a natural growth. In the females and young this growth of the cheek-bone and its covering of fat and skin are not seen; and it appears to be a mark of male beauty, as are also two sets of ridges on the skull, which greatly resemble those of the Gorilla.

Rajah Brooke, whose name will always be associated with Borneo, took great interest in Orang-utan hunting, principally with a view to decide how many kinds there were; and his first impressions on killing his first large one were excited by the prominent peculiarities just noticed. The first male he killed was seated lazily on a tree, and when the people approached he only took the trouble to hide behind the trunk, peeping first on one side and then on the other, and "dodging," as the Rajah did the same. He was wounded in the wrist, and afterwards was despatched. The Rajah wrote to the Zoological Society of London as follows:—"Great was our triumph as we gazed on the huge animal dead at our feet, and proud were we of having shot the first Orang we had seen, and shot him in his native woods, in a Borneo forest hitherto untrodden by European feet. We were struck with the length of his arms, the enormous neck, the expanse of face, which altogether gave the impression of great height, whereas it was only great power. The hair was long, reddish, and thin; the face remarkably broad and fleshy, and on each side, in the place of a man's whiskers, were the callosities, or rather fleshy protuberances, which I was so desirous to see, and which were nearly two inches in thickness. The ears were small and well shaped, the nose quite flat, the mouth prominent, the lips thick, the eyes small and roundish, the teeth large and discoloured, the face and hands black—these last being very powerful. This animal was four feet one inch in height, and its fore limb was three feet five inches and three-quarters in length; the width of the face, moreover, being as much as one foot one inch."

"Whilst the fore limb was so long, the lower limb, from the hip to the heel, only measured one foot nine inches; and hence there is great disproportion between the limbs, the legs and feet appearing dwarfed in comparison."

The Rajah considered the Orangs to be as dull and slothful as one could conceive, and on no

reaches from the back to the elbow, and which allows the animals, when hanging by one hand, to turn and twist the body slightly. The metacarpal bone of the little finger has a special muscle, which tends to enlarge the grasp of the hand. The great Apes have, however, an imperfect or deficient proper flexor to the thumb, and the extensor of the first joint of the thumb is wanting. The ill-developed "calf" has not its two great muscles combined in the one tendo Achillis, as in man, and the muscles of the foot are so arranged that they permit of much more independent motion than those of man have.

* *Simia satyrus. Simia morio.*

occasion, when pursuing them, did they move so fast as to preclude his keeping pace with them easily through a moderately clear forest, and even when obstructions below (such as wading up to the neck) enabled them to get away some distance, they were sure to stop and allow the hunters to come up. He never observed any attempt at defiance; and the wood which sometimes rattled about his ears was broken by their weight, and not thrown down, as some people imagine to be the case.

If pushed to extremity, the large male with crests on its head (which is called "Pappan"), could be formidable; and one unfortunate man, who, with a party, was trying to catch a large one alive, lost two of his fingers, besides being severely bitten in the face, whilst the animal finally beat off its pursuers. When the natives wish to catch an adult, they cut down a circle of trees round the one on which he is seated, and then fell that also, and close before he can recover himself, and try to bind him. The Rajah also notices the little dread the natives have of them, and that they form seats rather than nests in the trees.

These observations regarding their habits have been slightly opposed by Mr. Wallace, whose descriptions of Orang—or, as he prefers to call it, from the Dyak language, Mias—hunting and of their habits are undoubtedly the most reliable.

Wallace spent a long time in the islands of Borneo, Java, and Sumatra; and one of his principal objects in visiting the first especially was to obtain an insight as to the nature and life of the great man-like Apes of the country. After some time spent in hunting, he succeeded in shooting a full-grown male Orang-utan, and he describes the scene as follows:—

"I had just come home from an entomologi.ing excursion, when Charles rushed in, out of breath with running and excitement, and exclaimed, interrupted by gasps, 'Get the gun, sir—be quick—such a large Mias!' 'Where is it?' I asked, taking hold of my gun as I spoke, which happened luckily to have one barrel loaded with ball. 'Close by, sir—on the path to the mines; he can't get away.' Two Dyaks chanced to be in the house at the time, so I called them to accompany me, and started off, telling Charley to bring all the ammunition after me as soon as possible. The path from our clearing to the mines led along the side of the hill, a little way up its slope, and parallel with it at the foot a wide opening had been made for a road, in which several Chinamen were working, so that the animal could not escape into the swampy forest below without descending to cross the road, or ascending to get round the clearing. We walked cautiously along, not making the least noise, and listening attentively for any sound which might betray the presence of the Mias, stopping at intervals to gaze upwards. Charley soon joined us at the place where he had seen the creature, and having taken the ammunition, and put a bullet in the other barrel, we dispersed a little, feeling sure that it must be somewhere near, as it had probably descended the hill, and would not be likely to return again. After a short time I heard a very slight rustling sound overhead, but on gazing up could see nothing. I moved about in every direction, to get a full view into every part of the tree under which I had been standing, when I again heard the same noise, but louder, and saw the leaves shaking, as if caused by the motion of some heavy animal, which moved off to an adjoining tree. I immediately shouted for all of them to come up and try and get a view, so as to allow me to have a shot. This was not an easy matter, as the Mias had a knack of selecting places with dense foliage beneath. Very soon, however, one of the Dyaks called me and pointed upwards, and on looking I saw a great red hairy body and a huge black face gazing down from a great height, as if wanting to know what was making such a disturbance below. I instantly fired, and he made off at once, so that I could not then tell whether I had hit him. He now moved very rapidly and very noiselessly for so large an animal, so I told the Dyaks to follow and keep him in sight while I loaded. The jungle was here full of large angular fragments of rock from the mountain above, and thick with hanging and twisting creepers. Running, climbing, and creeping among these, we came up with the creature on the top of a high tree near the road, where the Chinamen had discovered him, and were shouting their astonishment with open mouth: 'Ya, ya, Tuan! Orang-utan, Tuan!' Seeing that he could not pass here without descending, he turned up again towards the hill, and I got two shots, and following quickly had two more by the time he had again reached the path; but he was almost more or less concealed by foliage, and protected by the large branch on which he was walking. Once while loading I had a splendid view of him, moving along a large limb of a tree in a semi-erect posture, and showing him to be an animal of the largest size. At the path he got on to one of the loftiest trees in the forest, and we could see one

ORANG-UTANS.

leg hanging down useless, having been broken by a ball. He now fixed himself in a fork, where he was hidden by thick foliage, and seemed disinclined to move. I was afraid he would remain and die in this position, and as it was nearly evening I could not have got the tree cut down that day. I therefore fired again, and he then moved off, and going up the hill was obliged to get on to some lower trees, on the branches of one of which he fixed himself in such a position that he could not fall, and lay all in a heap, as if dead or dying. I now wanted the Dyaks to go up and cut off the branch he was resting on, but they were afraid, saying he was not dead, and would come and attack them. We then shook the adjoining tree, pulled the hanging creepers, and did all we could to disturb him, but without effect; so I thought it best to send for two Chinamen with axes to cut down the tree. While the messenger was gone, however, one of the Dyaks took courage and climbed towards him, but the Mias did not wait for him to get near, moving off to another tree, where he got on to a dense mass of branches and creepers, which almost completely hid him from our view. The tree was luckily a small one, so when the axes came we soon had it cut through; but it was so held up by jungle ropes and climbers to adjoining trees that it only fell into a sloping position. The Mias did not move, and I

FRONT AND SIDE FACE OF THE ORANG.

began to fear that, after all, we should not get him, as it was near evening, and half-a-dozen more trees would have to be cut down before the one he was on would fall. As a last resource we all began pulling at the creepers, which shook the tree very much; and, after a few minutes, when we had almost given up all hopes, down he came with a crash and a thud like the fall of a giant. And he was a giant, his head and body being full as large as a man's. He was of the kind called by the Dyaks 'Mias Chapyian,' or 'Mias Pappan,' which has the skin of the face broadened out to a ridge or fold at each side. His outstretched arms measured seven feet three inches across, and his height, measuring fairly from the top of the head to the heel, was four feet two inches. The body just below the arms was three feet two inches round, and was quite as long as a man's, the legs being exceedingly short in proportion. On examination we found he had been dreadfully wounded. Both legs were broken, one hip-joint and the root of the spine completely shattered, and two bullets were found flattened in his neck and jaws; yet he was still alive when he fell. The two Chinamen carried him home tied to a pole; and I was occupied with Charley the whole of the next day, preparing the skin and boiling the bones, to make a perfect skeleton, which are now preserved in the museum at Derby."

The following description from the same author gives an excellent idea of the nature of the country inhabited by another Orang, and of its Monkey companions:—

"After a few miles, the stream became very narrow and winding, and the whole country on each side was flooded. On the banks were abundance of Monkeys—the common *Macacus cynomolgus*, a black *Semnopithecus*, and the extraordinary Long-nosed Monkey (*Nasalis larvatus*), which is as large

as a three-year-old child, has a very long tail, and a fleshy nose, longer than that of the biggest-nosed man. The further we went on the narrower and more winding the stream became; fallen trees sometimes blocked up our passage, and sometimes tangled branches and creepers met completely across it, and had to be cut away before we could get on. It took us two days to reach Semábanga, and we hardly saw a bit of dry land all the way. In the latter part of the journey I could touch the bushes on each side for miles; and we were often delayed by the screw-pines (*Pandanus*) which grew abundantly in the water, falling across the stream. In other places dense rafts of floating grass completely filled up the channel, making our journey a constant succession of difficulties. The mountain or hill was close by, covered with a complete forest of fruit-trees, among which the Durion and Mangosteen were very abundant; but the fruit was not yet quite ripe, except a little here and there. I spent a week at this place, going out every day in various directions about the mountain, accompanied by a Malay, who had stayed with me while the other boatmen returned. For three days we found no Orangs, but shot a Deer and several Monkeys. On the fourth day, however, we found a Mias feeding on a very lofty Durion tree, and succeeded in killing it, after eight shots. Unfortunately it remained in the tree, hanging by its hands, and we were obliged to leave it and return home, as it was several miles off. As I felt pretty sure it would fall during the night, I returned to the place early the next morning, and found it on the ground beneath the tree. To my astonishment and pleasure, it appeared to be a different kind from any I had yet seen; for although a full-grown male, by its fully-developed teeth and very large canines, it had no sign of the lateral protuberance on the face, and was about one-tenth smaller than the other adult males. The upper incisors, however, appeared to be broader than in the larger species, a character distinguishing the *Simia morio* of Professor Owen, which he has described from the skull of a female specimen. As it was too far to carry the animal home, I set to work and skinned the body on the spot, leaving the head, hands, and feet attached, to be finished at home. This specimen is now in the British Museum."

The Mias, as stated by Rajah Brooke, will turn upon an antagonist when hard pressed, and with no small bravery and ferocity; and this was satisfactorily proved by Mr. Wallace, who tells the following story:—

"About ten days after this, on June 4th, some Dyaks came to tell me that the day before a Mias had nearly killed one of their companions. A few miles down the river there is a Dyak house, and the inhabitants saw a large Orang feeding on the young shoots of a palm by the river side. On being alarmed he retreated towards the jungle, which was close by, and a number of the men, armed with spears and choppers, ran out to intercept him. The man who was in front tried to run his spear through the animal's body, but the Mias seized it in his hands, and in an instant got hold of the man's arm, which he seized in his mouth, making his teeth meet in the flesh above the elbow, which he tore and lacerated in a dreadful manner. Had not the others been close behind, the man would have been more seriously injured, if not killed, as he was quite powerless; but they soon destroyed the creature with their spears and choppers. The man remained ill for a long time, and never fully recovered the use of his arm. They told me the dead Mias was still lying where it had been killed, so I offered them a reward to bring it up to our landing-place immediately, which they promised to do. They did not come, however, till the next day, and then decomposition had commenced, and great patches of the hair came off, so that it was useless to skin it. This I regretted much, as it was a very fine, full-grown male. I cut off the head and took it home to clean, while I got my men to make a close fence, about five feet high, round the rest of the body, which would soon be devoured by maggots, small lizards, and ants, leaving me the skeleton."

On another occasion Mr. Wallace had an opportunity of observing the nest, or rather nest-making, which is performed by these animals when severely wounded. "He was called by a Chinaman working in Borneo to shoot a Mias which, he said, was on a tree close by his house at the coal-mines. Arriving at the place, we had some difficulty in finding the animal, as he had gone off into the jungle, which was very rocky and difficult to traverse. At last we found him up a very high tree, and could see that he was a male of the largest size. As soon as I had fired, he moved higher up the tree, and while he was doing so I fired again; and we then saw that one arm was broken. He had now reached the very highest part of an immense tree, and immediately began breaking off boughs all around, and laying them across and across to make a nest. It was very interesting to see how well

he had chosen his place, and how rapidly he stretched out his unwounded arm in every direction, breaking off good-sized boughs with the greatest ease, and laying them back across each other, so that in a few minutes he had formed a compact mass of foliage, which entirely concealed him from our sight. He was evidently going to pass the night here, and would probably get away early the next morning, if not wounded too severely. I therefore fired again several times, in hopes of making him leave his nest; but, though I felt sure I had hit him, as at each shot he moved a little, he would not go away. At length he raised himself up, so that half his body was visible, and then gradually sank down, his head alone remaining on the edge of the nest. I now felt sure he was dead, and tried to persuade the Chinaman and his companion to cut down the tree; but it was a very large one, and they had been at work all day, and nothing would induce them to attempt it. The next morning, at daybreak, I came to the place, and found that the Mias was evidently dead, as his head was visible in exactly the same position as before."

There is every reason to believe that the Mias, or Orang-utan, is confined to the two great islands of Sumatra and Borneo, in the former of which, however, it seems to be much more rare. In Borneo it has a wide range, inhabiting many districts on the south-west, south-east, north-east, and north-west coasts, but appears to be chiefly confined to the low and swampy forests. It seems, at first sight, very inexplicable that the Mias should be quite unknown in the Saráwak valley, while it is abundant in Sambas, on the west, and Sádong, on the east; but when we know the habits and mode of life of the animal, we see a sufficient reason for this apparent anomaly in the physical features of the Saráwak district. Where Mr. Wallace observed the Mias it was where the country is low, level, and swampy, and at the same time covered with a lofty virgin forest. Many isolated mountains, on some of which the Dyaks have settled, are close by, and are covered with plantations of fruit-trees. These are a great attraction to the Mias, which comes to feed on the fruits, but always retires to the swamp at night. When the country becomes slightly elevated, and the soil dry, the Mias is no longer to be found. For example, in all the lower parts of the Sádong valley it abounds, but as soon as we ascend above the limits of the tides, where the country, though still flat, is high enough to be dry, it disappears. Now, the Saráwak valley has this peculiarity: the lower portion, though swampy, is not covered with continuous lofty forests, but is principally occupied by the Nipa palm; and near the town of Saráwak, where the country becomes dry, it is greatly undulated in many parts, and covered with small patches of virgin forest and much second-growth jungle, on ground which has once been cultivated by the Malays or Dyaks. "Now it seems to me," writes the same author, "that a wide extent of unbroken and equally lofty virgin forest is necessary to the comfortable existence of these animals. Such forests form their open country, where they can roam in every direction, with as much facility as the Indian on the prairie or the Arab on the desert; passing from tree-top to tree-top without ever being obliged to descend upon the earth. The elevated and the drier districts are more frequented by man, and are more cut up by clearings and low second-growth jungle. They are not adapted to its peculiar mode of progression, and they would be more exposed to danger, and more frequently obliged to descend upon the earth in such places. There is probably also a greater variety of fruit in the Mias district, the small mountains which rise like islands out of it serving as a sort of gardens or plantations. It is a singular and very interesting sight to watch a Mias making his way leisurely through the forest. He walks deliberately along some of the larger branches in the semi-erect attitude, which the great length of his arms and the shortness of his legs cause him naturally to assume; and the disproportion between these limbs is increased by his walking on his knuckles, not on the palm of the hand, as we should do. He seems always to choose those branches which intermingle with an adjoining tree, on approaching which he stretches out his long arms, and seizing the opposing boughs, grasps them together with both hands, seems to try their strength, and then deliberately swings himself across to the next branch on which he walks along as before. He never jumps or springs, or even appears to hurry himself, and yet manages to get along almost as quickly as a person can run through the forest beneath. The long and powerful arms are of the greatest use to the animal, enabling it to climb easily up the loftiest trees, to seize fruits and young leaves from slender boughs which will not bear its weight, and to gather leaves and branches with which to form its nest."

Mr. Wallace, who described how it forms a nest when wounded, states "that it uses a similar one to sleep in almost every night. This is placed low down, however, on a small tree, not more than from

ORANG AT BAY.

twenty to fifty feet from the ground, probably because it is warmer and less exposed to wind than higher up. Each Mias is said to make a fresh one for himself every night; but I should think that is hardly probable, or their remains would be much more abundant; for though I saw several about the coal-mines, there must have been many Orangs about every day, and in a year their deserted nests would become very numerous. The Dyaks say that when it is very wet the Mias covers himself over with leaves of Pandanus, or large ferns, which has, perhaps, led to the story of his making a hut in the trees. The Orang does not leave his bed till the sun has well risen and has dried up the dew upon the leaves. He feeds all through the middle of the day, but seldom returns to the same tree two days running. They do not seem much alarmed at man, as they often stared down upon me for several

FAMILY OF ORANG-UTANS.

minutes, and they only moved away slowly to an adjacent tree. After seeing one, I have often had to go half a mile or more to fetch my gun, and in nearly every case have found it on the same tree, or within a hundred yards, when I returned. I never saw two full-grown animals together, but both males and females are sometimes accompanied by half-grown young ones, while, at other times, three or four young ones were seen in company. Their food consists almost exclusively of fruit, with occasional leaves, buds, and young shoots. They seem to prefer unripe fruits, some of which were very sour, others intensely bitter, particularly the large red fleshy arillus, or rind of one, which seemed an especial favourite. In other cases they eat only the small seed of a large fruit, and they almost always waste and destroy more than they eat, so that there is a continual rain of rejected portions below the tree they are feeding on. The Durion is an especial favourite, and quantities of this delicious fruit are destroyed wherever it grows surrounded by forest, but they will not cross clearings to get at them. It seems wonderful how the animal can tear open this fruit, the outer covering of which is so

thick and tough, and closely covered with strong conical spines. It probably bites off a few of these first, and then, making a small hole, tears open the fruit with its powerful fingers. The Mias rarely descends to the ground, except when, pressed by hunger, it seeks for succulent shoots by the river side; or, in very dry weather, has to search after water, of which it generally finds sufficient in the hollows of leaves. Once only I saw two half-grown Orangs on the ground, in a dry hollow at the foot of the Simunjou Hill. They were playing together, standing erect, and grasping each other by the arms. It may be safely stated, however, that the Orang never walks erect, unless when using its hands to support itself by branches overhead, or when attacked. Representations of its walking with a stick are entirely imaginary. The Dyaks all declare that the Mias is never attacked by any animal in the forest, with two rare exceptions; and the accounts I received of these are so curious, that I give them nearly in the words of my informants, old Dyak chiefs, who had lived all their lives in the places where the animal is most abundant. The first of whom I inquired said:—'No animal is strong enough to hurt the Mias, and the only creature he ever fights with is the Crocodile. When there is no fruit in the jungle, he goes to seek food on the banks of the river, where there are plenty of young shoots that he likes, and fruits that grow close to the water. Then the Crocodile sometimes tries to seize him, but the Mias gets upon him, and beats him with his hands and feet, and tears him, and kills him.' He added that he had once seen such a fight, and that he believes that the Mias is always the victor. My next informant was the Orang Kaya, or chief of the Balow Dyaks, on the Simunjou River. He said: 'The Mias has no enemies; no animals dare attack it but the Crocodile and the Python. He always kills the Crocodile by main strength, standing upon it, pulling open its jaws, and ripping up its throat. If a Python attacks a Mias, he seizes it with his hands, and then bites it, and soon kills it. The Mias is very strong; there is no animal in the jungle so strong as he.'"

It is very remarkable that an animal so large, so peculiar, and of such a high type of form as the Orang-utan, should be confined to so limited a district—to two islands, and those almost the last inhabited by the higher Mammalia; but in the Mid-Tertiary Period, and just before the formation of the Himalayan Mountains, Orangs lived on the continent of India, and their remains have been found fossilised. With what interest must every naturalist look forward to the time when the caves and Tertiary deposits of the tropics may be thoroughly examined, and the past history and earliest appearance of the great man-like Apes be at length made known!

The Orang-utans appear, from what has been written by all competent observers, to be of two kinds, the one larger, and the other smaller in stature; the first is called *Simia satyrus*, and the other *Simia morio*. Simia is translated in old Latin dictionaries as an Ape, or Jackanapes, and the term was used to designate the tribe or genus which should include all the species or kinds of man-shaped Apes. But after a while there was thought to be sufficient reasons for separating the Troglodytes from the genus Simia, and therefore this last-named one, instead of comprising the Gorilla, the Nschiego, the Koolo, the Soko, and the Chimpanzee, has but the Orang-utan.

Why this separation should have taken place is of course a very natural question, and the answer is that there are sufficient differences in the construction of the Orangs and the Chimpanzees and the others to warrant it. There is a greater structural difference between the Orang and the Chimpanzee than between this last and any of its congeners, that is to say, species included in the genus Troglodytes.

Moreover, on examining several skulls and skeletons of all these kinds, it seems as if, whilst the African Troglodytes may have descended from a common ancestor, probably a Baboon, the Orang-utan could not have come from the same stock.

There are some important distinctions in the anatomy of the Orang, some of which are evidently produced by adaptation to a particular habit or mode of life, and others in which the results of cause and effect cannot be traced.

In making its way through the forest, and in climbing so constantly that any position on the ground is rare, the great length of the fore limbs is of immense use to them. They nearly touch the ground, so long are they, when the creature is erect, and this peculiarity separates them from the Chimpanzees. In climbing, the blade-bone is of great importance; and in the Orang it is broader, and more like that of man than in the Chimpanzee and Gorilla, and its spine is inclined upwards; and one of the processes of the blade-bone which has to do with the muscles which pass from the shoulder to the arm, and

which is called the coracoid, is more inclined downwards than in the Apes already described. Now, the blade-bone of the Chimpanzee and its coracoid are admirably adapted for climbing; why are they not, therefore, exactly like those of the Orang, and *vice versâ*? This is not a difference produced by adaptation of means to ends, but one which relates to the origin of the two animals, and to those which preceded them. The same is the case in respect of the wrist of the Orang. It has one bone more than the Chimpanzee, which has the same number as in other Troglodytes, and in man also. This bone is fixed in between the two rows of the bones of the wrist, and is called the "intermediate," and is found in the Monkeys which are below the Orang in the animal scale. It is an offshoot of the scaphoid bone.

Oddly enough, although the number of the ribs of the Troglodytes is thirteen, and probably in one of them there are fourteen, there are only twelve in the Orang; and the breast-bone, which consists of a large upper bone and several smaller ones (united above and below to each other, in the Troglodytes), has these bones separate and halved, as it were, sideways in the Orang, resembling in it the condition of the bones of the immature man. In the Troglodytes the round top of the thigh-bone, where it fits into its socket, the hip, has a kind of rope-like ligament attaching the one bone to the other, but this does not exist in the Orang. The knee-cap is very small, and the heel-bone hardly projects backwards in the Orang, and the "toe-thumb" sticks out at right angles from the foot, being about one-quarter of its length. The Orang is a great climber, and rarely, if ever, walks on its sole, which the Chimpanzee can do slightly. The general appearance and the nature of the movements of the foot of the Orang is that of a thin "club foot." All the turning-in of the bones of the foot in the Chimpanzee is exaggerated in the Orang, whose toe-thumbs are capable of great activity. Tame Orangs may be noticed to use the foot, which is longer than the lower leg, in climbing, as perfectly as the hand; and it appears that the frequency of their movements of grasping, rather than of delicate prehension, tends to the last joint of the "toe-thumb" becoming small and losing its nail.

A huge air-pouch is packed away in front of the windpipe and amongst the muscles of the neck, as in the Apes already noticed, and it commences in the so-called ventricles of the larynx. Its extension amongst the upper muscles of the chest is most remarkable, for when full of air, these being relaxed, it must blow out the upper part of the body and neck in a singular manner.

One of the muscles of the chest, common to man and Apes, the great pectoral (*pectoralis major*) —which has already been noticed as springing from the ribs, the breast and collar-bone, and to be attached in front of the groove in the upper arm-bone—is not a continuous sheet of muscular fibre as in man, but is divided into a number of bundles, there being at least three great ones. Now, it is between these and in their intervals that the vast laryngeal air-pouch is found on the chest. Great as it is, however, it does not appear to have anything to do with the voice, except, perhaps, to produce resonance during distension.

The muscles of the hips, thigh, and leg-bones of the Orang cannot be distinguished generally from those of the Chimpanzee; but it is evident that the position of some is such as to make straightening of the knee very difficult, and on the contrary, they assist jumping and climbing, or any movement in which it can be kept permanently bent. As it is most convenient for the foot of the Orang to be well expanded during climbing or holding on, and not for its bones to be too much forced together sideways, the animal is deficient in a muscle which exists in man,* and which stretches transversely across, between the ends of the metatarsal bones. In like manner the inability of the thumb to perform many separate actions is produced by the absence of the flexor muscle; but there is a slip of a muscle whose tendon reaches the first joint, and its office is to oppose the thumb, not to the palm of the hand, but to the first joint of the second finger. This is a monkeyish peculiarity.

The animal, using as it does its short toe-thumb for grasping forcibly, requires all the power possible to be exercised between its bones and those of the ankle. Hence it has a muscle which exists in the hand but not in the foot of man, and which, from its drawing the bones together, is called the *opponens* (of the great toe). This does not appear to exist in the Troglodytes.

The other most important peculiarities of the muscles which relate to the greater but less independent movement of the toes and fingers, are the connection of the long flexor of the "toe-thumb" with the lower and outer part of the thigh-bone, and the possession of a complete set of deep extensor

* The *Transversus pedis*.

muscles for the four outer fingers. The extensor of the first, and the corresponding muscle of the little finger, subdivide to supply the third and fourth. This is the case in the next group of Apes also, but in the Troglodytes each of these muscles has but a single tendon.*

ORANG AND NEST.

Before considering the anatomy of the brain, skull, and the inside of the Orang, it is as well to become aware of some of its peculiarities when young, and in a state of captivity.

* A muscle, called the *accessory flexor* of the toes, is absent in the Orangs, and one termed *scansorius*, or climber, exists on the outside of the hip and the joint of the thigh.

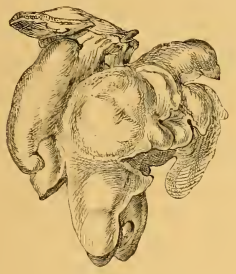
Several young Orang-utans have been brought to Europe and exhibited, to the delight of every one who saw them, but Mr. Wallace was fortunate enough to obtain one in its native haunts, and to observe it in its own climate. After shooting a female Mias, he found a little tiny one, lying face downwards, in the swamp where they were. "It was only about a foot long," writes Mr. Wallace, "and had evidently been hanging to its mother when she first fell. Luckily, it did not appear to have been wounded, and after we had cleaned the mud out of its mouth it began to cry out, and seemed quite strong and active. While carrying it home it got its hands in my beard, and grasped so tightly, that I had great difficulty in getting free, for the fingers are habitually bent inwards at the last joint, so as to form complete hooks. At this time it had not a single tooth, but a few days afterwards it cut its two lower front teeth. Unfortunately, I had no milk to give it, as neither Malays, Chinese, nor Dyaks ever use the article, and I in vain inquired for any female animal that could suckle my little infant. I was therefore obliged to give it rice-water from a bottle, with a quill in the cork, which after a few trials it learned to suck very well. This was very meagre diet, and the little creature did not thrive well on it, although I added sugar and cocoa-nut milk occasionally, to make it more nourishing. When I put my finger in its mouth it sucked with great vigour, drawing in its cheeks with all its might in the vain effort to extract some milk, and only after persevering a long time would it give up in disgust, and set up a scream very like that of a baby in similar circumstances. When handled or nursed, it was very quiet and contented, but when laid down by itself would invariably cry; and for the first few nights was very restless and noisy. I fitted up a little box for a cradle, with a soft mat for it to lie upon, which was changed and washed every day; and I soon found it necessary to wash the little Mias as well. After I had done so a few times, it came to like the operation, and as soon as it was dirty would begin crying, and not leave off till I took it out and carried it to the spout, when it immediately became quiet, although it would wince a little at the first rush of the cold water, and make ridiculously wry faces while the stream was running over its head. It enjoyed the wiping and rubbing dry amazingly, and when I brushed its hair seemed to be perfectly happy, lying quite still, with its arms and legs stretched out, while I thoroughly brushed the long hair of its back and arms. For the first few days it clung desperately with all four hands to whatever it could lay hold of, and I had to be careful to keep my beard out of its way, as its fingers clutched hold of hair more tenaciously than anything else, and it was impossible to free myself without assistance. When restless, it would struggle about, with its hands up in the air, trying to find something to take hold of, and, when it had got a bit of stick or rag in two or three of its hands, seemed quite happy. For want of something else, it would often seize its own feet, and after a time it would constantly cross its arms, and grasp with each hand the long hair that grew just below the opposite shoulder. The great tenacity of its grasp soon diminished, and I was obliged to invent some means to give it exercise and strengthen its limbs. For this purpose I made a short ladder of three or four rounds, on which I put it to hang for a quarter of an hour at a time. At first it seemed much pleased, but it could not get all four hands in a comfortable position, and, after changing about several times, would leave hold of one hand after the other, and drop on the floor. Sometimes when hanging only by two hands, it would loose one, and cross it to the opposite shoulder, grasping its own hair; and, as this seemed much more agreeable than the stick, it would then loose the other and tumble down, when it would cross both, and lie on its back quite contentedly, never seeming to be hurt by its numerous

YOUNG ORANG.
(From Wallace, by permission of the Publishers.)

tumbles. Finding it so fond of hair, I endeavoured to make an artificial mother, by wrapping up a piece of buffalo-skin into a bundle, and suspending it about a foot from the floor. At first this seemed to suit it admirably, as it could sprawl its legs about and always find some hair, which it grasped with the greatest tenacity. I was now in hopes that I had made the little orphan quite happy; and so it seemed for some time, till it began to remember its lost parent, and try to suck. It would pull itself up close to the skin, and try about everywhere for a likely place; but, as it only succeeded in getting mouthfuls of hair and wool, it would be greatly disgusted, and scream violently, and after two or three attempts, let go altogether. One day it got some wool into its throat, and I thought it would have choked, but after much gasping it recovered, and I was obliged to take the imitation mother to pieces again, and give up this last attempt to exercise the little creature. After the first week I found I could feed it better with a spoon, and give it a little more varied and more solid food. Well-soaked biscuit, mixed with a little egg and sugar, and sometimes sweet potatoes, were readily eaten; and it was a never-failing amusement to observe the curious changes of countenance by which it would express its approval or dislike of what was given to it. The poor little thing would lick its lips, draw in its cheeks, and turn up its eyes with an expression of the most supreme satisfaction when it had a mouthful particularly to its taste. On the other hand, when its food was not sufficiently sweet or palatable, it would turn the mouthful about with its tongue for a moment, as if trying to extract what flavour there was, and then push it all out between its lips. If the same food was continued, it would set up a scream, and kick about violently, exactly like a baby in a passion. After I had had the little Mias about three weeks, I fortunately obtained a young Macaque Monkey (*Macacus cynomolgus*), which, though small, was very active, and could feed itself. I placed it in the same box with the Mias, and they immediately became excellent friends, neither exhibiting the least fear of the other. The little Monkey would sit upon the other's stomach, or even on its face, without the least regard to its feelings. While I was feeding the Mias, the Monkey would sit by, picking up all that was spilt, and occasionally putting out its hands to intercept the spoon, and as soon as I had finished would pick off what was left sticking to the Mias' lips, and then pull open its mouth to see if any still remained inside, afterwards lying down on the poor creature's stomach as on a comfortable cushion. The little helpless Mias would submit to all these insults with the most exemplary patience, only too glad to have something warm near it which it could clasp affectionately in its arms. It sometimes, however, had its revenge; for when the Monkey wanted to go away, the Mias would hold on as long as it could by the loose skin of its back or head, or by its tail, and it was only after many vigorous jumps that the Monkey could make its escape. It was curious to observe the different actions of these two animals, which could not have differed much in age. The Mias, like a very young baby, lying on its back, quite helpless, rolling lazily from side to side, stretching out all four hands into the air, wishing to grasp something, but hardly able to guide its fingers to any definite object, and when dissatisfied opening wide its almost toothless mouth, and expressing its wants by a most infantine scream; the little Monkey, on the other hand, in constant motion, running and jumping about wherever it pleased, examining everything around it, seizing hold of the smallest objects with the greatest precision, balancing itself on the edge of the box, or running up a post, and helping itself to anything eatable that came in its way. There could hardly be a greater contrast; and the baby Mias looked more baby-like by the comparison. When I had had it about a month, it began to exhibit some signs of learning to run alone. When laid upon the floor it would push itself along by its legs, or roll itself over, and thus make an unwieldy progression. When lying in the box it would lift itself up to the edge into almost an erect position, and once or twice succeeded in tumbling out. When left dirty, or hungry, or otherwise neglected, it would scream violently till attended to, varied by a kind of coughing or pumping noise, very similar to that which is made by the adult animal. If no one was in the house, or its cries were not attended to, it would be quiet after a little while, but the moment it heard a footstep would begin again harder than ever. After five weeks it cut its two upper front teeth, but in all this time it had not grown the least bit, remaining, both in size and weight, the same as when I first procured it. This was, no doubt, owing to the want of milk or other equally nourishing food. Rice-water, rice, and biscuits were but a poor substitute, and the expressed milk of the cocoa-nut, which I sometimes gave it, did not quite agree with its stomach. To this I imputed an attack of diarrhœa, from which the poor little creature suffered greatly, but a small dose of castor-oil operated well, and cured

it. A week or two afterwards it was again taken ill, and this time more seriously. The symptoms were exactly those of intermittent fever, accompanied by watery swellings on the feet and head. It lost all appetite for its food, and after lingering for a week, a most pitiable object, died, after being in my possession nearly three months. I much regretted the loss of my little pet, which I had at one time looked forward to bringing up to years of maturity and taking home to England. For several months it had afforded me daily amusement by its curious ways and the inimitably ludicrous expression of its little countenance. Its weight was three pounds nine ounces, its height fourteen inches, and the spread of its arms twenty-three inches. I preserved its skin and skeleton, and in doing so found that, when it fell from the tree, it must have broken an arm and a leg, which had, however, united so rapidly, that I only noticed the hard swellings on the limbs where the irregular junction of the bones had taken place."

There is evidently much intelligence in the young Orang, when brought in contact with man, but probably in its native woods it leads a very quiet and almost mechanical life, there being nothing to develop extra instincts, thought, or unusual intelligence. Of course, some are more active than others, and many have to use greater exertion than others to obtain food. Hence, whilst there is no



AIR POUCHES OF ORANG.
(*After Temminck.*)

BRAIN OF ORANG.
(*From Royal College of Surgeons.*)

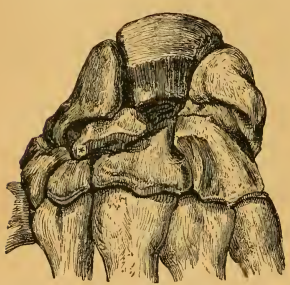
increased growth of the mental organ after Orang childhood, there may be great increase of the muscular structures. In the first instance, the brain case does not enlarge internally, and the old ones have no more brains than the young; and in the second, the ridges on the skull, the spines of the neck, and the markings on the bones generally do grow immensely, so as to give attachment to extra-muscular fibres.

Moreover, besides these causes of growth there are those hidden ones which refer to sex, the old males acquiring a hideous aspect in our eyes, but lovely in those of the more comely female Miases, from the growth of long head ridges and the curious face pads. The bulk of the brain of an Orang is about one-half of that of a man of ordinary mind; and the brain itself, whilst it is higher in measurement than that of any of the Apes already mentioned, is long and flat in comparison with that of man. In front it tapers off slightly, and is not flat in front and below, for there the eye-cases or orbits, by projecting upwards, render the brain in their neighbourhood, as it were, excavated. As in the other Apes, the back of the brain is well developed, and the several parts distinguishable in man exist. One of the furrows so visible in the Troglodytes, which marks the side of the brain towards the back (the occipito-temporal), is scarcely in existence in the Orang.

There is something very human in the appearance of the brain case in the young of both species of Orang. The back and sides have the peculiar "bumpy" look of those of the child; there are then no crests, and the brow ridges, extremely small, merge into a straightish forehead. The face looks long in front of the eyes, or orbits, and these are elliptical or oval, and approaching the circular in outline.

The cheeks look wide even in the young ones; and it will be noticed that the bone of the upper jaw (superior maxillary bone) has a short projection, which joins the molar or cheek-bone at some distance from the jaw. There is a hole or holes under the orbit in man and in the Troglodytes which transmits a nerve to the face, and people who have tic-douloureux know where it is very well; this is close to the junction of the molar and jaw-bones in the Troglodytes, but in the Orang this junction is much further off the middle of the face. This causes the extra width to the cheeks. The bone there forms the surface upon which the curious pad of fat and skin rests, which gives such an ugly look to the face in the old ones, when all these parts have grown to excess. The young have milk teeth, and in the upper jaw the last crushing or molar tooth has large cusps behind and projecting inwards, and the incisor teeth are equal in size. In the lower jaw the incisors are grooved in front in a curious manner; and the great molar teeth with five cusps have a curiously wrinkled-looking surface. Underneath the skull looks long, and the hole for the spinal cord is much longer than broad, and the joints or condyles are distant from the front of it. The palate is broad and the nose cavity also, and there is a bony styloid process connected with the ear-bone.

In the female of the *Simia morio*, which is the smallest Orang, all the structures just mentioned as characterising the young *Simia satyrus* and the young male *Morio* are exaggerated. There are faint frontal ridges also, and the back ridge or crest is shown, but there is hardly any difference in the size of the brain case. The front bone of the upper jaw is very distinct; and the creature whose skull is in the British Museum had its permanent teeth, the milk ones having fallen. There was the same number of teeth as in the Troglodytes and in man. But it is in the old males that the juvenile structures are greatly altered; and it is indeed hard to believe their skulls ever could have belonged to the same species. In the old males the brain case has not increased in its capacity, but it is furnished with huge ridges along the front and crossing behind. The ridges commence on the brow ridges and the outside of the orbits, which are no longer nearly circular, but flattened above; they pass on to the forehead, and curve to join in the middle line of the skull, forming a crest. This meets at the back a crest coming from the tip of each ear-bone. The cheek-bones are huge and wide apart; the upper canine teeth are great, and their sockets mark the face. The palate is huge, wide, and not arched; and the upper middle incisors project, and are very large, cutting indeed upon three of the lower ones.



WRIST BONES OF ORANG.

All the roughnesses for the attachment of muscles are great, and the lower jaw is immense, and the tooth next to the lower canine—the first false molar—is pointed and cutting behind. Finally, the opening for the spinal cord (the foramen magnum) is round in front, and the condyle joints are close to its anterior margin. These are changes during the growth which are worth considering, especially as they cause the animal to depart from many of its man-like characters, which are so well seen in the young and in the females.

The Orang has no uvula, and the papillæ of the back of the tongue are in the shape of the letter V. Its stomach differs somewhat in shape from that of man and the Troglodytes, but its vegetable diet determines the existence of a large intestine which has a little ending or appendix (vermiformis) as in man.

* Is the intermediate bone.

SIAMANG.

CHAPTER IV.

THE MAN-SHAPED APES (*concluded*)—THE GIBBONS*—1. THE SIAMANGS—2. THE TRUE GIBBONS.

General Characteristics of the Species—THE SIAMANG—Its Habits and Anatomy—Distinctness from the Orangs and Gibbons—Special Peculiarities—THE WHITE-HANDED GIBBON—Where Found—Its Cry—Its Habits—Special Anatomical Features—THE HOOLOOK—Where Found—A Young One in Captivity—Shape of the Skull—THE WOOYEN APE—Its Appearance and Habits—THE WOW-WOW—Very little Known about it—THE AGILE GIBBON—Reason of the Name—Peculiarities of the Anatomy—General Comparison of the Different Varieties of the Great Apes.

THE Orang-utan is not the only man-shaped Ape of the forests and jungles of the great Asiatic Islands, for there are several others to be found there, and which also live on the main land, from Malacca far away to the north in Assam; southwards, in the peninsula of Hindostan, and in South China.

They are less human-looking than the red Orangs, and they are smaller and more slender, but when they walk for a short distance erect, with the arms above the head balancing the body, their resemblance to a small and hairy "lord of creation" is considerable. A very slight glance distinguishes them from the Orangs; they have straight backs, small heads, large eyes, rather prominent chins, very long fore-arms, and their fingers reach the ankle in some, and the ground in others. Moreover, the Orangs sit upon a surface of hair, and these are furnished with a hard padlike seat which is bare, and is called a callosity, but they have no tail. They can run.

These long-armed Apes have a number of names, but as a whole they are called Gibbons; and as their outside and inside differences and distinctions from the Orangs are considerable and more than those of the kinds of Orangs between themselves, they are grouped into a separate genus. The

* *Hylobates.*

Orangs form, as has been stated before, the genus *Simia*, and these Gibbons constitute the genus *Hylobates*, a term taken from the Greek ὑλοβάτης, a walker in the woods.

So far as their intelligence, amiability, and teachableness are concerned, they are equal to the Orangs, and indeed they seem to adapt themselves to the methods of men more readily. Not only do they become very fond of their keepers, but they recollect them after the lapse of time; and they are constantly let loose by those who keep them in India to wander about the trees in the neighbourhood, and they will return to be cared for, and come, when called, to be fed.

Interesting to those who study the intelligence of animals, they are equally so to the common observer, who delights in witnessing their surpassing agility, wonderful leaps, and graceful swings from bough to bough. But to the anatomist they present many complicated problems; for although evidently not so high in the animal scale as the Orangs and Chimpanzees, they have some things about them which cause them to resemble man more than do these great Apes, and others which cause them to resemble the large army of Monkeys. They are the last of the man-shaped in the classification, and the usual plan is to place them after the Orangs.

They are extremely delicate animals, although their fur is thick, and, in some kinds, long. They require a considerable temperature and very pure air; hence, although many have been brought to Europe, and exhibited to the delight of thousands, they do not live long, dying usually from consumption or from some lung disease. In the British Museum there are several groups of stuffed specimens of them, and also many skulls and skeletons, and a cursory examination of the first will prove that it is very difficult to distinguish one kind from another, for in the same kind, or species, there is a great variety of colour, and a different individuality in the two sexes and young. It has happened that the same kind has been called by several names by different observers, and it is only when the skeleton has been examined with the stuffed specimen that a satisfactory distinction between the species or kinds has been made.

Evidently, the whole of these long-armed Apes, with small heads and callosities on the seat, are separable into two divisions. In one the animals are larger than the others, and have a very singular adaptation of the foot for rapid movement amongst the boughs, and they have air-pouches; and in the second the animals are smaller, and have the toes free, and have no pouches. So the genus *Hylobates* is divided into two divisions: 1. The Siamangs. 2. The True Gibbons.

THE SIAMANG.*

Sir Stamford Raffles brought the Siamang prominently before the scientific world, and noticed the curious manner in which some of the toes were united, and he considered that this was to enable them to swing rapidly from branch to branch during their ordinary movements in the forest, when any stretching out of the fingers might be dangerous and produce a fall. But in this, as in many others, we owe to Mr. Wallace thanks for a concise description of the habits of the creature, which, from having its toes partly joined, has been named *Syndactylus*, from the Greek words σὺν and δάκτυλος, which mean "together" and "finger."

"A very curious Ape, the Siamang, was rather abundant, but it is much less bold than the common Monkeys, keeping to the virgin forest, and avoiding villages. This species is allied to the little long-armed Apes of the genus *Hylobates*, but is considerably larger, and differs from them by having the two first fingers of the feet united together, nearly to the end; whence its name. It moves much more slowly than the *Hylobates*, keeping lower down in the trees, and not indulging in such tremendous leaps; but still it is very active, and by means of its immense long arms—five feet six inches across in an adult about three feet high—can swing itself along among the trees at a great rate. I purchased a small one, which had been caught by the natives, and tied up so tightly as to hurt it. It was rather savage at first, and tried to bite, but when we had released it, and given it two poles under the verandah to hang upon, securing it by a short cord running along the pole with a ring, so that it could move easily, it became more contented, and would swing itself about with greater rapidity. It ate almost any kind of fruit and rice, and I was in hopes to have brought it to England, but it died just before I started. It took a dislike to me at first, which I tried to get over by feeding it constantly myself.

* *Hylobates syndactylus.*

One day, however, it bit me so sharply while giving it food that I lost patience, and gave it rather a severe beating, which I regretted afterwards, as from that time it disliked me more than ever. It would allow my Malay boys to play with it, and for hours together would swing by its arms from pole to pole, and on to the rafters of the verandah, with so much ease and rapidity, that it was a constant source of amusement to us. When I returned to Singapore it attracted great attention, as no one had seen a Siamang before, although it is not uncommon in some parts of the Malay peninsula."

There are some interesting points about the relation of the construction of this animal and its method of moving. Thus, in grasping a bough with the arm at full length above the head, so as to leave it with a swing in order to grasp another rapidly and for a correspondingly short period of time, the fingers require to be kept together as much as is possible, and to remain more or less bent on the palm. The long thumb may or may not be used, but in order to move efficiently it must be free, and also strong. Now in the Siamang these necessary peculiarities are present, and the common use of the finger and thumb in taking hold of things in the ordinary manner is sacrificed to them, and there is little or no delicacy of fingering or of prehension. Moreover, the fingers and thumbs are extremely thin and delicate, and in order to render the first finger less movable, it is, to a certain extent, deficient in its muscles of extension; and the common bending or flexor muscle of the fingers is very independent of that of the thumb. In compensation there is a special muscle found in this genus alone, which pulls the top of the second finger towards the thumb.* The skeleton of the hand shows that the fingers are slightly curved. There is no doubt that the hand of the Siamang, although it has these peculiar muscles, the curve of the bones, and also the extra bone noticed in the Orangs, is, as far as its skeleton is concerned, much more human than that of the other Apes. The extensor muscles of the fingers resemble those of the Orangs. The hand is larger than the foot in these animals, and the fore-arm is much longer than the upper arm.

A French naturalist states that the animal can leap, or, rather, swing—for it is done with the fore limbs—with graceful agility at least eighty feet, and the muscles of the arm, which are connected with the chest, aid in this. The pull is from the stationary arm to the chest of the movable body by muscular contraction; and the greater the muscular connection between the arm and chest, the greater will be the movement. In order to provide for this, the great muscle of the front of the upper arm, the biceps (see page 26), is not only attached, as in the other Apes and in man, to the blade-bone just above the arm-joint, but also to the chest in front, for it is united there with the great muscle which springs from the ribs and breast-bone, and is attached high up to the arm (*pectoralis major*). In some of the other Apes this second part of the biceps is attached to a bent projection (coracoid) of the blade-bone, so that it has no direct attachment with the chest itself.

The Siamang can walk fairly in the erect posture by balancing with the arms, or by placing them over the head, and it has a great power of grasp with its toe-thumb. The shape of the foot resembles that of man more than that of the Troglodytes and Orangs, and the heel-bone is strong, and projects but slightly, and the toe-thumb is stout and long. The muscles of the foot are, as it were, more separate than in man, especially the flexors: and there is an extra muscle, an abductor of the third joint of the second toe.

The ability to walk well was proved when a tame Siamang used to walk along a cabin table at sea, without disturbing the crockery; and curiously enough this was better done than were some of the ordinary movements of the hand, for drinking out of the palm was a most ineffective and clumsy effort.

The bones of the foot resemble those of man more than do those of the Apes already noticed; but the first and second fingers are united by a fold of skin.

Under the jaw and along the throat of a tame Siamang, a large swelling, not very well covered with hair, was visible enough. This was a vast air or laryngeal pouch, and pressure emptied it into the throat. Hence the creature in this point resembles the Orangs and the Troglodytes, but the use of the sac could not be satisfactorily decided. The sac opens into the windpipe by two apertures, which are in a membrane that unites the base of the tongue and the organ of voice together. It has an uvula.

They are quiet, inoffensive animals, full of affection for man, and having good memories. Their

* The abductor of the third joint of the second finger. The thumb counts as the first finger.

temper is short enough sometimes, especially if there is any disappointment, but they have none of the mischievous tricks or malice of the Monkeys. Liking milk occasionally, they still mainly feed on fruit and leaves, and hence the nature of their teeth, the size of their jaws, and the capacity of their brain case may be fairly anticipated.

The bulk of the brain is less in comparison with that of the Orang, and the hind part does not quite cover or overlap the cerebellum, and the whole skull is long and low, and slightly broad behind. The most striking parts about it are the cavities for the eyes (the orbits), which are nearly circular in outline, deep, open, and swollen behind; moreover, they are wide apart, and there is no brow ridge connecting them. They, the face and the lower jaw, occupy only one-half of the skull, and the brain case is composed of the usual bones, which are extremely faintly ridged, the ridges extending on either side from the outer part of the orbit on to the frontal and parietal (or side) head bones. The back of the skull is rough, for the attachment of muscles, and the opening for the spinal cord and the joints for the top of the neck are far back, so that the head is set, as it were, forward in respect of the spine. There is a long and narrow roof to the mouth, and the diastema, or space in the line of the teeth, in front of the upper eye or canine teeth, is very distinct. These teeth are long, thin, and grooved, and project rather outwards as well as far below the other upper teeth. Yet, in all probability, this is not a bloodthirsty sign, but one which may have to do with sex, the males of many of the Monkeys possessing these great teeth only, or having them larger than the females. The first, or incisor teeth, occupy a very small space, and they and the two front molars are like those of man. An examination of the three true crushing molars shows the last, or that nearest the back of the jaw, to be the largest. They have four cusps or projections, which are small but decided, and somewhat resemble those of insect-eating animals.

SKELETON OF THE SIAMANG.
(*From the "Cyclopædia of Anatomy and Physiology."*)

The lower jaw is very remarkable, for it has a good straight chin; and the joint and the part which passes from it to the body of the jaw, or the "angle," resembles that of man more than that of the rest of the Apes.

The lower teeth are very unlike the upper, and the canines are smaller; the first false molar is pyramidal, and has a cutting surface in front and behind. The true molars have at least five cusps or projections, and are admirably suited for the creature's diet.

One of the most curious points about the Siamang is that the broad breast-bone, the blade-bone, and large chest, and the ribs present human resemblances, but there are fourteen pairs of these last. The hip-bones are long and do not curve far in front, but the joint of the thigh is situated more after the manner of that of man than is the case in the other great Apes.

Everything in this creature's anatomy, and, amongst other things, its delicate, long bones, great grasp, supple back, small head, long neck, and long hair, assist in its peculiar life, which is evidently one of much climbing, swaying, swinging, and passing from tree to tree with the hands rather than with the feet. It lives in Sumatra and in the Malay peninsula.

THE TRUE GIBBONS.

The other kinds of Hylobates are called the True Gibbons, and although in their habits they greatly resemble the Siamang, they are smaller in size, and have some very remarkable structural differences. They inhabit the mainland of India and the great islands of Borneo and Sumatra, or, rather, all the great islands of the Indo-Malayan sub-region, except the Philippines. They are found in Sylhet and Assam, and Camboja, in South China, to the west of Canton, and in the island of Hainan.

GROUP OF SIAMANGS AND GIBBONS.

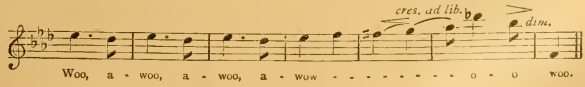
THE WHITE-HANDED OR LAR GIBBON.*

A well-known kind of Gibbon, which is found in Tenasserim, is called the White-handed Gibbon, or *Hylobates lar.* The old Latin dictionaries translated "lar" as a god who preserved both house and land, and presided over cities and houses, or the chimney or fireside; but this evidently does not apply to the Gibbon. But the Lar, or Lares, were demons, genii, or sprites, and probably the sprite-like activity of the Gibbons in their own woods suggested the name.

The Hylobates Lar is found in great abundance in all the forests skirting the hills, which run

WHITE-HANDED GIBBON. (*From a stuffed specimen.*)

from north to south in the country of Tenasserim, south-west of Burmah. They ascend the hills up to an elevation of from 3,000 to 3,500 feet, but not higher, and are met with in parties of from eight to twenty in number, composed of individuals of all ages. It is rare to see a solitary one; occasionally, however, an old male will stray apart from the flock, and perch on the summit of some vast tree, whence his howls are heard for miles around. The forests which these animals inhabit resound with their cries from sunrise to about nine in the morning, and their usual call may be thus rendered:—



The sounds vary from the deep notes of the old ones to the sharp treble of the young, in horrible unison. During these vocal efforts they appear to resort to the tops of the loftiest trees, and to call

* *Hylobates lar.*

each other from different parts of the jungle. After nine or ten o'clock they begin to think of eating, and are soon engaged in feeding on fruit, young leaves, buds, shoots, and insects, for which they occasionally come to the ground. When approached, if alone, they will sit so close, doubled up in a thick tuft of foliage, or behind the fork of a tree, and so screened as to be safe from the shot of the sportsman. With a companion this manœuvre is of course useless. But even when the creature is forced from its hiding-place it is not easily shot, for it swings from branch to branch with its long arms, shaking the boughs all round, and flinging itself from prodigious heights into the dense under-scrub, and is quickly concealed from view. This long-armed Ape does not walk readily on its hind-legs, and has to stop frequently and prop or urge itself on, having the knuckles on the ground. In sitting it often rests on its elbows, and it likes to lie on its back. They make great use of their hind limbs, and of the hand-foot especially, for they will cling on and swing with their fore-hands, and steal and carry anything which pleases them with their hinder ones. In captivity it is generally a gentle, peaceable animal, very timid; but when captured after its young days have passed, it becomes very wild. The adults soon die, and even the young seldom reach maturity when deprived of liberty. They are born generally in the early part of the cold weather, a single one at a time, two being as rare as human twins. The young one clings safely to the mother for about seven months, although she swings and climbs to perfection, and then it shifts for itself. They may be made cross, like most creatures, by being teased, and anger is then shown by a steady look, with the mouth held open, and the lips occasionally drawn back to show the eye teeth, with which they bite severely. But usually it attacks with its long hands, which are at such times held dangling and shaken in a ridiculous manner, like a person who has suddenly burnt his fingers. It drinks in a curious and difficult manner, by scooping the water in its long narrow hand, and thus conveying a very little drop at a time to its mouth.

Usually the young are feeble, dull, and querulous in captivity, and sit huddled up together on the ground, seldom or never climbing trees. On the smooth surface of a matted floor they will run along on their feet and slide on their hands at the same time. By being fed solely on plantains, or on milk and rice, they are apt to lose all their fur, presenting in their nude state a most ridiculous appearance. Few recover; but by change of diet, and especially by allowing them to help themselves to insects, some of them come round, and resume their natural covering. For the most part they are devoid of those pranks and tricks which are exhibited by the smaller Monkeys. The length of a full-grown male was two feet six inches; the fore limb measured two feet one inch, and the hind limb one foot seven and a half inches. The Lar or White-handed Gibbon has a black skin and hair, and there is a white band round the entire face, across the forehead.

The Lar is common in its native haunts, and is subject to great variation in its colour. Some are dark brown or black, with white hands and feet, and they have the circle of white hairs around the face, the band across the forehead coming down in a peak above the nose. Others are ochre-brown, and have a lighter-coloured hand, foot, and anklet; whilst many are a dirty white. They take odd fancies, and likes and dislikes. Some which are allowed in India to roam about the grounds of the Zoological Gardens there will come in to sleep, and are exceedingly gentle to men, but extremely savage to women; others do not do this.

In looking at the collection in the British Museum, every one must be struck with the long necks of these creatures, which do not allow the little muzzle and snub-like nose to come down on a level with the breast-bone (as in the Chimpanzee, for instance), and also with the extremely narrow and long hands and feet, with their thin fingers. It will be also noticed that the nails of their thumbs and toe-thumbs are flat, whilst all the rest are claws. Their chin is less prominent than that of the Siamang, and this is shown in the skull. In the lower jaw there are some interesting differences between the Lar and the Siamang which cannot readily be accounted for; firstly, the crushing teeth wear in pits in the middle, whilst a ridge is formed in the Siamang; and in the Lar the angle of the jaw is decidedly turned in or inflected, as the term is, a condition which will be noticed in the other Hylobates.

No air or laryngeal sac is found in the Lar or in any Gibbon, and its noise has therefore nothing to do with such an organ.

Their swinging from branch to branch is assisted by the same arrangement of the muscle of the arm as in the Siamang: and they have the *transversus pedis*, which was stated to be wanting in the Orang, and it is united with the adductor of the thumb.

THE HOOLOOK.*

Naturalists have ransacked nearly every part of the globe for interesting animals, and have procured them from very out-of-the-way places. One of these localities was particularly difficult to get at years ago, for it is in the hills, far away to the north-east of Calcutta, on the other side of the great river Brahmapootra, in Assam. Amongst the Garrow and Cossyah hills, where there are wild gorges, and uplands crowded with vast forests, overlooking the wide plains of the river-valley, there were many wonderfully active Gibbons. About two feet in length, they were capable of swinging with unerring certainty from branch to branch, many feet apart; and even the females performed these constant and natural movements while their young were hanging to them. They were black in colour, with white eyebrows, or, rather, a white band across the forehead. When caught, they soon became tamed, especially when young, and were docile and affectionate. One which was kept by Dr. Burrough was two feet six inches in length, yet the fore-limb was only five inches shorter than this, the length of the hand itself being six inches.

SKULL OF HOOLOOK.

So great was the disproportion of the legs and arms, that the first were, including the feet, only nineteen inches long, and the fingers touched the ground readily when he was standing erect. This Hoolook was of a deep black colour, and he had the usual simple band of white across the forehead, and black hands and feet. He was caught in the usual haunt of this species, not on the upper, but on the lower hills, which do not reach a greater altitude than 500 feet, and being well treated, he was easily tamed, and his habits were capable of being well watched. He liked the fruit of the peepul-tree better than anything, and bananas; but he took to rice and milk, and enjoyed snapping up a sweet or two, and especially delighted in Spiders. Meat he cared little about, and pork and beef he detested, but he liked fish occasionally. After about a month's captivity he took a great fancy to his master, and would come to his call, and sit up to breakfast. He liked to help himself to chicken and egg, and at first was very bad in his manners, dipping his fingers into the coffee and milk, and then sucking them. Afterwards he was taught to hold a cup and to drink from it.

He would walk erect slowly, first on one foot and then on the other, and would put his long arms over his head to balance his body, as it swayed first on one side and then on the other as his pace increased; then he began to run, and at last, grasping a bough, would swing himself forwards first with one hand and then with the other, getting over twenty to thirty paces with the greatest ease and regularity. He was timid, very reluctant to oppose those who teased him, and usually retreated at once. His master used to brush his skin for him when he was out of sorts, and the sensation appears to have been most pleasurable, and he evidently enjoyed the gentle friction very much. Falling ill he had a dose of calomel and a warm bath, the latter remedy being much more to his taste than the other.

The skull in the Hoolook has less breadth across the orbits than in the Lar; and in that of a young one the sutures or joinings of the skull-bones are distinct, showing that the side-bones (parietal) of the head unite with the front (frontals), the temporal or ear-bones, and with a part of a wing-shaped bone which forms part of the base of the skull (sphenoid bone). The angle of the jaw projects backwards, and it is slightly turned in; moreover, the projections or cusps of the lower back teeth are five in number, and are prominent-looking and very sharp, as if they could crush a beetle as well as crack a nut.

THE WOOYEN APE, OR YUEN.†

A number of Apes were found in company on a small island near Camboja, and at first sight they appeared to be of different kinds, although they all had the long arms and the general appearance of

* *Hylobates hoolook.* † *Hylobates pileatus.*

the "Long-armed Apes" (*Hylobates*). But a careful examination proved that they belonged to one particular species, the individuals of which differ greatly in their colour during different parts of their lives. The young were uniformly dirty white in colour, and had no black spots on their chests or heads. The females were white, with the fur of the back brownish-white, slightly waved, and there was a large black spot on the crown and one on the chest. On the other hand the male was black, and the back of the head, body, and legs greyish. The hands were white. This variation in colour at different ages and in different sexes in one kind should teach us that something more than mere outside distinctions is requisite for deciding the value of what are called species. The dark cap-like mass of hair on the head gives the name to this Ape. Evidently the animal is a puzzle and a source of the

HOOLOOK. (*From a stuffed specimen in the British Museum.*)

marvellous to the Chinese, for one of their gazetteers gives a mixture of correct information regarding its natural history, and of what has been drawn from a very vigorous imagination.

It is described in the following manner, as coming from the district of Hainan:—"Yuen—male black, female white, like a Macaque, but larger, with the two fore-arms exceedingly long. Climbs to tree-tops, and runs among them backwards and forwards with great agility. If it falls to the ground it remains there like a log! Its delight is in scaling trees, as it cannot walk on the ground. Those desiring to rear it in confinement should keep it amongst trees, for the exhalations of the earth affect it with diarrhœa, causing death: a sure remedy for this, however, may be found in a draught made of the syrup of the fried foo-tse" (seeds of *Abrus precatorius*, the Indian liquorice).

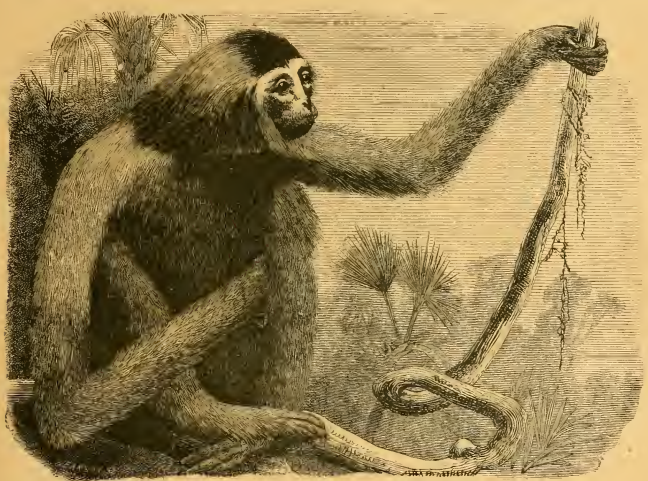
In a work called *Pun Yu liang che*, the various kinds of Yuens are mentioned which are known to the author. "There are three kinds of Yuens—the Golden-silk Yuen, which is yellow; the Jade-faced Yuen, which is black; and the Jet-black Yuen, which has the face also black. The Golden-silk and the Jade-face are both difficult to procure." "Hainan has also the Rock Yuen; it is small, about the size of one's fist. If allowed to drink water it grows in size. This is also called the Black Yuen, and

is difficult to obtain." "The word Yuen is given to them from their love of climbing and their wild disposition."

In Central Hainan the magistrate of the district was of opinion that the Yuen had the power of drawing its long arm-bones into its body, and that when it drew in one it pushed out the other to such an extraordinary length that he believed the two bones united in the body. He used the front bones of the arms for chopsticks.

THE WOW-WOW.

A species which is called the Wow-wow, or Silvery Gibbon (*Hylobates leuciscus*), is perhaps more interesting to the anatomist than to the observer of the habits of animals; for nothing is known about



WOOYEN APE. (*From a stuffed specimen in the British Museum.*)

their method of living. Their skull shows a decided ridge or crest along the top, which branches well in front into two ridges going to the front over the orbit. Moreover, the chin of the lower jaw is very deep, the angles slightly turned in, and the eye teeth are thin and sharp.

THE AGILE GIBBON.*

This animal is also interesting, from having a great twist inwards of the jaw behind, and two curious ridge-like crests on the head. Its name conveys the extreme agility of the animal, as observed in confinement.

These Gibbons have many interesting points about them, and one of the most curious is that they have no air or laryngeal pouches, and yet their general anatomy, especially of the muscles of the throat, neck, and body, is the same as that of the Siamang, which has been noticed above to have a vast pouch. The brain is small, especially behind, but why it is difficult to imagine, for the Spider Monkey, which lives in the New World, and whose feats of agility resemble those of the Gibbons,

* *Hylobates agilis.*

has a very large back portion of the brain, large even in proportion to that of man; and the importance of this difference is all the greater when it is remembered that all the last investigations into the actions of the nerves arising from the sides of the brain towards the back connect them with motions of the hands and fore-limbs especially. But it is possible that the back of the brain in the Siamang appears to be smaller than it really is, because of the large size of the cerebellum. The skulls of the Gibbons are very man-like, and more so than those of the other Apes, and this is because of their faces and jaws being smaller in comparison with the brain case. If the young of all the great Apes

AGILE GIBBON.

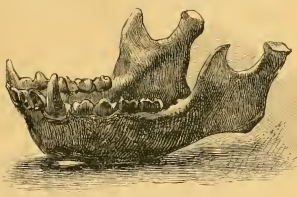
be examined, their skulls will appear much more human than those of the adults, because the brain and face grow up to a certain point together and equally; but with age the brain does not increase in size proportionally with the face, which grows on, and finally preponderates in size. But if the skulls of the young Apes be compared one with the other, that of the Siamang will really not look as human as that of the Gorilla or Chimpanzee.

The Gibbons have a very small appendage to the blindgut, and they have hard bare pads or callosities on the seat, and these structures connect them with the next group of Monkeys, which cease to be man-shaped; and indeed the Gibbons and Siamangs, although man-shaped (Anthropomorpha), occupy neutral ground between the Orangs and the Cynomorpha.

Formerly, in those ages when the Orang lived on the continent of India, the Gibbons roamed far over the vast land surfaces of the period, and lived in Southern France. Portions of the skeleton of

an Ape as large as a man, but which resembled the Hylobates, were found there, and named *Dryopithecus*, in strata of Mid-Tertiary age.

In concluding this part of the subject, which relates especially to the man-shaped Apes, some very obvious reflections occur. There is something very interesting as well as instructive and suggestive in the study of the proportions of the limbs to each other and to the body in the larger Apes, of which the Gorilla is the highest in the scale, and in man. The fingers in man hang down to below the middle of the thigh; in the Gorilla they attain the knee; in the Chimpanzee they reach below the knee; in the Orang they touch the ankle; in the Siamang they reach the sole; and in some Gibbons the whole palm may be applied to the ground without the trunk being bent forward beyond its natural position on the legs. It is also found that in man the arm-bone exceeds in length each of the bones of the fore-arm in a marked manner, and in the Gorilla and Chimpanzee it does so but slightly; the bones are equal in the Orangs, and very unequal in the Gibbons, those of the fore-arm being the longest. When the length of the arms down to the wrist is compared with that of the body, omitting the legs, there is not much difference between man and the Gorilla, but it increases in the Chimpanzee, Orang, and in the Siamang. The lower limbs are short in the Gorilla, and this is characteristic—they offer but a poor support to the huge body—and the resemblance to the symmetrical proportion of the legs to the body in man is scanty indeed. This disproportion is greater in the Chimpanzee and Orangs, in which the lower limbs are pigmies.



JAW OF THE GIBBON.

Consider the hand in the same manner. Man's perfect hand, writes Owen, is one of his peculiar physical characters, and that perfection is mainly due to the differences of the first and the other four fingers, and the ability of this first to be opposed to them, as a perfect thumb. A partially opposable thumb, that is to say, one which can be brought over the palm, more or less, is present in the hand of the great Apes. It is large in the Gorilla, so far as Apes are concerned, and it reaches, when it and the fingers are stretched out, to just a little beyond the first joint of the first finger, or rather of its first movable part. But in the Chimpanzee and Orang it does not reach to the joint, and it is longest and strongest in proportion in the Gibbons (*Hylobates*). In the Gorilla and the Chimpanzee, the wrist-bones are eight in number, but there are nine in the Orangs and Gibbons.

BACK OF JAW OF THE AGILE GIBBON.

The toe-thumb is about five-twelfths of the length of the whole foot in the Gorilla, and it is slightly longer in the Chimpanzee and Hylobates, but it is not more than a fourth of the length of the foot in Orangs.

The nails of all the fingers and toes of the great Apes are flattened, except in the Hylobates, whose thumb and toe-thumb nails only are so; the rest are more claw-like.

Finally, as regards the brain and nervous system. In the man-shaped Apes the brain is smaller as compared with the nerves which proceed from it than in man; and the brain proper is smaller relatively to the cerebellum than in man. The convolutions, the fissures, and eminences of the brain are generally less complex, and those of the two sides or hemispheres of the brain are more symmetrical than in man. The sides of the brain or the hemispheres are rounder and deeper in man, and the proportions of their lobes to one another are different. Some convolutions and fissures present in man are less perfectly formed, but still exist in the Apes, and the cerebellum is not covered entirely in the Hylobates, but it is in the other Anthropomorpha.

CHAPTER V.

THE DOG-SHAPED MONKEYS*—1. SEMNOPITHECUS—2. COLOBUS.

General Characteristics of the Monkeys of the Old World—Distioguished from the Apes by Length of the Hinder Limbs, and presence of Tails—Divided into those with and those without Cheek-pouches—Use of the Cheek-pouches—The two Genera of Pouchless Monkeys—THE SACRED MONKEYS, or Semnopitheci—Derivation of the Name—First Discovery—Ape Worship in India—General Description—Limited to Asia—THE SIMPAI—Its Locality and Appearance—THE BUDENG—Hunted for their Fur—Its Colour and Appearance—THE LONG-NOSED MONKEY—Reason of the Name—Quaint Appearance of the Young—Anatomical Peculiarities—Their First Appearance in Europe—Description of the Nose—Peculiar Formation of the Stomach—Bezoars—THE HOONUMAN MONKEY—The Sacred Monkey of the Hindoos—Legends about it—THE DOUC MONKEY—Its Appearance and Habitat—THE BLACK-LEGGED DOUC—Anatomical Peculiarities—THE CROWNED MONKEY—THE RED MONKEY—THE SUMATRA MONKEY—THE WHITE-BEARDED MONKEY—Found in Ceylon—Its Intelligence—THE GREAT WANDEROO—Other Ceylonese Monkeys—THE GENUS COLOBUS, or Thumbless Monkeys—Description of the Hand and Wrist—Different Varieties—COLOBUS VERUS—COLOBUS GUEREZA—Their Habitat and Peculiarities—Fossil Semnopitheci.

THE Apes which have formed the subject of the previous chapters, and which, from their greater or less resemblance to man, have been called the *Anthropomorpha*, have long arms, short legs, and no tails. The great length of the fore limb distinguishes them not only from man, but also from all the other Quadrumana, and so does the relative shortness of the hinder limbs. The length of limb is thus sufficient to afford data for classifying the Quadrumana of the Old World in two great groups, of which the Anthropomorpha form the first, and the rest of the Monkeys the second. In these the fore limb is invariably the *shortest*, and the hinder one the *longest;* so that there is exactly the reverse condition of that observed in the great Apes. With regard to the tail question, it may be stated that, whilst many species have very long tails, others have them of moderate length, and a few have none.

The Monkeys of this second group, or the Cynomorpha, all of which live in the Old World, have a thin division (septum) between the nostrils, whose openings look downwards, or downwards and outwards. They are Catarhine Quadrumana (see page 3), and many have cheek-pouches, but not all, whilst all have the peculiar pads, more or less brightly coloured, which are placed where the animal sits, or on the swelling of the haunch-bone. All these Old World Monkeys have the same number of teeth as the Apes already described, and arranged in the same manner, and most have a laryngeal or air pouch; but there is great diversity in their size, shape, and in the method of progression of the body and shape of the head, and also in the construction of the brain and internal organs. Moreover, the arrangement of the muscles and of the back-bone differs.

The presence or absence of the cheek-pouches, the peculiarity in the shape of the teeth, the shape of the body and limbs, and the method of moving along, are all matters of importance to the zoologist, for by them he is enabled to arrange these Monkeys in genera and species, so as to give the naturalist the proper name of the kind whose habits he may be studying. Moreover, the comparative anatomist, in examining the insides of these creatures, and explaining their peculiarities of internal construction, is able to account for many habits and the presence of many structures, as well as to assist the zoologist. For, a classification, to be good for anything, must be more than skin deep, and must depend upon the differences in those parts which are not readily changed by habits or peculiar methods of life.

The Monkeys of the Old World, excluding the great Apes already described, and including alone those with long hind limbs, may be divided into those without cheek-pouches and those which have them; and those in the first division form the subject of this chapter. Cheek-pouches may be seen crammed with nuts in most of the Monkeys at the Zoological Gardens, and the appearance given to the face is as if the skin on each side of the lower part of it were distended. When there are no nuts thus stowed away, the cheeks do not present a swollen or unusual appearance. The Monkey does not force nuts outside its jaws and between them and the cheeks so as to simply distend

* *Cynomorpha.*

them, but it presses its food into what look like some folds in the cheek. These unfold, and form a bag or pouch on each side of the face, and the animal can eat, scream, and scold with the pouches full, and without their contents coming by chance into the mouth. The gift of a cheek-pouch is of great importance to a Monkey; it is a stowaway for his food, which may have to be carried some distance before it can be eaten. And it must be remembered, that not only have the Monkeys very indefinite notions of *meum et tuum*, but that they are surrounded by dangers from many other

FACE OF THE BLACK-CRESTED MONKEY.

animals; they are communists, and their motto is *la propriété c'est le vol;* and, on the other hand, the great beasts of the earth, whose stealing is less thought of, because it is done with great violence, openly, and on a large scale, put down the Monkeys whenever they have the chance. But Nature, ever a considerate mother, whilst she is exceedingly economical, and does not allow any structures to be unused or wasted without gradually abolishing them, often gives animals which are defective in some things very important compensation.

The pouchless Monkeys are evidently at a disadvantage; but by this system of compensation they have very peculiar stomachs, in which they can stow away quite as much food before more is absolutely wanted as their pouched friends can. The nature of this stomach will be noticed further on; and it is

only necessary to observe that it is not in existence in the cheek-pouched division at all. The cheeks of the Monkeys with the peculiar stomach, on the other hand, are not pouched, but there is just the vestige of a fold or two, which, although of no use, still remains as an evidence of their ancestry—for, doubtless, these are descended from those with pouches. The great Anthropomorphous Apes have no cheek-pouches, neither have the American Monkeys; and, for reasons which will be noticed in treating of these last, they have not the complicated stomach of the Old World pouchless group.

The pouchless division of Monkeys with complicated stomachs, and which, of course, have long hind limbs, comprehends two genera—the genus Semnopithecus, and the genus Colobus.

THE SACRED MONKEYS.

The Semnopitheci, or the Sacred Apes—from σεμνός (sacred), and πίθηκος (an Ape)—were probably known to the Greeks who invaded India under Alexander the Great; and Ctesias, a Greek writer, who was taken prisoner by Artaxerxes of Persia, at the battle of Cunaxa, some 400 years B.C., studied them. He was kept for seventeen years at the court of that monarch, and made notes on most subjects, and also on the natural history of Persia and India. On his return to Athens he gave the world the results of his observation in a book, and in it he treats of two Apes, one of which was smaller than the other, and had a very long tail. This was a Semnopithecus, for the genus is especially Asiatic; but the ancients did not discriminate between the long-tailed Apes of Africa and those of Asia, but called both Cercopithecus—from κέρκος (a tail), and πίθηκος (Ape). At the present time the word Cercopithecus is restricted to the kinds which live in Africa. These differ in their internal construction from the Asiatic varieties.

During the rise of the religion of Brahma, the contemplation of the Creator became singularly mixed up with the worship of the created, and many animals became sacred. Hence, when one of those wandering restless spirits, Gasparo Balbi by name, started in 1570 from the town of Venice, where he was a jeweller, to reach the Indies, and came to the end of his journey, he saw many a long-tailed Ape worshipped and petted by his customers. He wandered amidst many a danger—but the people were honest then—and reached Aleppo. Then he went by caravan to Bagdad, and got to Old Babylon—by the way, "a place perilous for robbers and lions." Reaching Bagdad, he embarked for Balsora, and reached that place after escaping whirlpools and hot and deadly winds. Thence he went to the cities of St. Thomas, by the Seven Pagodas, in Southern India. Leaving there, and much troubled by tigers, he crossed the Ganges and got into Pegu on the Irawady. He admired the Pagodas, or as they are there called, "the Varelles of the gods," and says that about them are found "tyed many Apes of that kind which resemble Mountain Cats, which were called Monkeys; they keep them very carefully, holding them to be creatures beloved of God, because they have their hands and feet like human creatures, and therefore the woods are full of them, for they never take any excepe for their Varelles and statues." This regard for the Long-tailed Monkey has lasted, and probably is only now diminishing under the influence of the rationalistic philosophy of the wicked Europeans, who will not see anything holy in an Ape. Certain it is that the follies of Ape-worship were carried on to a wonderful extent, and that these creatures have been preserved to the serious detriment of crops, comfort, and temper.

The regard of the natives for them was, and probably is still, sincere, and their boldness—the result of immunity from persecution—was discovered very early in the English occupation of India; for Tavernier tells a story of an English "President," who asked him to shoot some Monkeys, which were amusingly audacious by the river side. He complied, and a female fell dead with her young clinging to her. This so enraged the Monkeys that sixty of them descended at once, and had it not been for the serving-men, and the carriage being shut up, they would have strangled the "President." They followed the carriage for many miles. Then we are told about Indian princes spending fortunes on the marriage-feasts of Apes; and of cultivators of the soil being scared away and subjected to all sorts of rapine by these holy creatures. All this goes to prove that generations of Hindoos have believed in the sacred character of the Monkey, and have placed him in their mythology.

So Fred. Cuvier, when he wanted a name, termed them Sacred Apes, or *Semnopitheci*. They have been called Slow Apes, but this is quite a misnomer, for when awake, and not tired, they are as full of fun, activity, and play, but not as full of malice, as the others.

Wallace, in his charming book of travels in the great Islands of Sumatra and Borneo, thus noticed how full of life they are :—"In Sumatra, Monkeys are very abundant, and at Lubo Raman they used to frequent the trees which overhang the guard-house, and gave me a fine opportunity of observing their gambols. Two species of Semnopithecus were most plentiful—Monkeys of a slender form, with very long tails. Not being much shot at, they are rather bold, and remain quite unconcerned when natives alone are present; but when I came out to look at them, they would stare for a minute or two, and then make off. They take tremendous leaps from the branches of one tree to those of another a little lower. It is very amusing when one strong leader takes a bold jump, to see the others following with more or less trepidation; and it often happens that one or two of the last seem quite unable to make up their minds to leap till the rest are disappearing, when, as if in desperation at being left behind, they would leap as far as they could, and often come crashing down into the underwood."

The Semnopitheci may be described as Monkeys with hind limbs long, and larger than the fore limbs, with slender bodies, usually highest at the tail, and round heads, and with not very prominent faces, and very long tails. They have callous pads on the haunch-bones, and in some there are slight folds inside the cheeks, but no pouches. The hands have thumbs, and the last tooth of the lower jaw (the third molar) has a prominent heel to it, or cusp, besides four others. They are of all sizes, and the largest are bigger than a Pointer Dog; but they are all slightly made, and their long bodies, thin as a rule, are larger in the stomach than in the chest. Their tails, which hang down and are not curled up, distinguish them pretty readily.

The Monkey which shows the peculiarities of the genus *Semnopithecus* more than others is, perhaps,

THE BLACK-CRESTED MONKEY, OR THE SIMPAI.*

It was noticed and described by Sir Stamford Raffles as a native of Sumatra, where it is frequently seen in the neighbourhood of Bencoolen. It has a long and slender body, very long hind-legs, and the tail end is higher than the shoulders in walking. The fore-legs are short, and the tail is very long, and exceeds thirty inches in length, and the head is small and wonderfully straight in the forehead and face.

The colours of this Simpai are very different to those of the great Apes already mentioned. Here variety of colour replaces the sameness of the tints of the large Anthropomorpha. First, there is a long crest of black hair on the top of the head, which passes slightly round the face close. On the cheeks there is a tuft of fawn-coloured hairs, which graduate into white. The forehead is of a light fawn-colour, and the face is naked, slightly wrinkled, and of a blue tint. The under parts of the body are very white, and on the back and neck the colour is bright yellow and red. The palms and soles are black, the thumbs are small, and the callosities are large.

THE NEGRO MONKEY.†

This is, as the name implies, a black Monkey. It is intensely black, except underneath, and at the root of the tail, where there is a grey tint. The paws are long, delicate, and silky, and become slightly grey on the head and back with old age. Like most black things, it leads a troubled life, being chased and hunted, not, however, in this instance so much for amusement as for the pretty black fur. They live in great troops, in the Javanese forests, and sometimes fifty or more individuals associate together. They make rude nests in trees, and are extremely timid, making off with great haste if they are disturbed. A long series of generations has been chased and killed by the natives of Java, and therefore the present Negro Monkeys are exceedingly shy, and bolt from the face of man at once. And yet, although thus timid and anxious to get out of the way, they have the reputation of being dangerous, and really unwittingly they may be so. On the approach of men they utter loud screams, and scamper off amongst the trees, helter-skelter. Now in doing this, they break dead branches off, and sometimes a large fruit or nut comes tumbling down some score or two of feet. These are supposed to be thrown by the Monkeys, but such is not the case. Having this bad character, the "Negroes" are cudgelled with sticks, and killed in numbers very cruelly.

* *Semnopithecus melalophus.* † *Semnopithecus maurus.*

Their pretty fur is much prized, and the chiefs of the country arrange the hunting parties, treating the Monkeys really as beasts of the field. The skins are prepared by a simple process which the natives have learned from Europeans; and they conduct it with great skill. It affords a fur of a jet-black colour, covered with long silky hairs, which is used by the natives and Europeans there in ornamenting riding saddlery and in military decorations.

When young, they are of a brown or reddish tint, and thin grey tints appear preceding the intense black; they then eat buds and shoots and tender leaves, but in adult age they are fruit consumers. When in captivity they are sullen and morose, and they will remain sulky for many months. This the natives know, and therefore they never try to tame them, or to have them in their houses. In their shape they resemble the last Monkey described, and their hind limbs are very long, their haunches being high.

NEGRO MONKEY.

They are rather more than two feet long in the body, and the neck appears short; both shoulders and chest are short and largely made. The tail is as long as the body and head, and is often slightly tufted at the end. A mop of hair surrounds the face, and the hairs are long and closely pressed, and quite conceal the forehead. The nose is peculiar, for the bones of it are ridged, as it were, and the skin is drawn tight over the open nostril (nares), so that there is no soft nose. A very considerable space exists between the nostrils and the mouth, and the lips are small and thin.

THE LONG-NOSED MONKEY.*

Of all the remarkable oddities of Nature amongst the many-shaped Monkeys, the Long-nosed or Proboscis-carrier stands pre-eminent. In fact, there is nothing in human or ape nature like the face of one particular Long-tailed Semnopithecus from Borneo. Monkeys have flat noses as a rule, some have a ridge and a little fleshy mass in which the nostrils end; others, like the Baboon, have dog-like noses, and the Americans have wide noses, the nostrils opening well at the sides. In man there is the Roman nose, the pug, the straight, the flat, the broken, the long with a large end, and the short with a turn up, but the Nasalis Monkey stands alone amongst the Primates with a nose of vast proportions, which projects far in advance of the mouth, and whose nostrils open underneath. It grows with age, and commences as a small "turn up," which still is more fleshy and longer than the nose of any Monkey. The newly-born Nose Monkey is a most extraordinary object, reminding the critical eye of many youths of weak constitution and defective brains. Its hair is wonderfully parted down the middle, and brushed by Dame Nature down the sides of the head and a little backwards; the whiskers take the latter direction, and the ears stand out just behind them. It has drooping eyelids, a longish

* *Semnopithecus nasalis.*

upper lip, with just a little sign of coming hair, and then there is the funny nose, the upper part like a boy's, but the end seems to have been pulled out and turned up, so that the nostrils are quite at the tip. The face has a tinge of blue about it, and the animal, even when old enough to be sitting on a tree, looks sad and melancholy.

They grow to the size of a large Pointer Dog, and are powerful animals, assembling in troops, and playing and associating probably with the Orangs. Stuffed specimens of the Proboscis Monkey are usually simple caricatures, and by no means good ones, for they do not give one-half of the curious appearance of the face. In nature, and in drawings taken shortly after death, the first thing that strikes one is the flat top to the head, and the red hair there, starting from the top of the crown, and radiating in all directions, and coming as a very sharp line straight over the eyebrows, and cutting the forehead very short. Then the prodigious nose, stuck out some inches in front of the mouth, is,

LONG-NOSED MONKEY.

with the rest of the face, naked, and of a reddish-brown flesh-colour. The eyes are wide apart and open, and are of a hazel colour. The whiskers clasp the face, as it were, and are brushed back, and join the hair of the neck, whilst the little beard sticks out like a goat's. The mouth is wide, and the chin recedes. It is a long-bodied creature, and there is a great bend outwards in the back when it squats on its haunches. There is a good-sized chest, there are long arms, still longer legs, and a great tail. The prevailing colour of the back and shoulders is the red or dark-red brown of the head hair, whilst the rest of the body is of a lighter tint, the tail and limbs especially. The thumb of the hand is small, and barely reaches as far as the first finger-joint, but the toe-thumb is large, widely set from the foot, and the skin-fold comes far down it, as also does a web between the toes, the third of which is the longest.

The skull of this Monkey greatly resembles that of the other Semnopitheci. The face part is smaller in comparison with that of the great Apes, but then it is not much larger than the brain case. There is a faint ridge at the side, and the usual one from one ear to the other exists. The front of the face on each side of the opening for the nose is rather larger and more prominent than in

some other kinds, but there are no evidences of the existence of the great fleshy and gristly mass which is stuck on in front in life. This swelling of the front of the face in the skull slightly reminds us of a greater one which characterises the Dog-faced Baboons, and, moreover, the similarity is increased by the fact that the upper eye (canine) tooth presses the first tooth behind the lower eye tooth backwards. These little peculiarities are inherited gifts, for the Nasalis and the Baboon probably came from a common ancestor. Perhaps the great fleshy nose of the Semnopithecus Nasalis is a relic of the long face of the ancient Baboon. Shorten the bones of the Baboon's nose, and leave the soft parts, and there would be left something like the queer features of the Monkey now under consideration.

One must be struck with the long back-bone of this Monkey, its single backward bend, and the long way the ribs seem from the hips; making it like the Gibbons, and very unlike the other great Apes, which have their last ribs close to their hips. The tail is very long, and starts well up the back, that is to say, its origin at the end of the sacrum bone is some distance from the haunches, on which the creature sits. These last are rounded so as to afford comfortable rest, especially as they are covered by the callosities or pads. The feet are long from the metatarsal bones, and the great toe-thumb is accompanied by a long, strong, backward-projecting, and curved-up heel-bone.

YOUNG LONG-NOSED MONKEY.

The Dyaks call this Monkey the Kaha, for this is the sound which they make when in companies in the woods by the side of the swamps and jungles. There they live a restless life at sunrise and sunset, being quieter in the heat of the day, and crying out at each other. They have fine voices, thanks to their strength, and perhaps to the air sac in their neck, which may render oral sounds more resonant. They are active creatures, and bound from tree to tree, clearing from fifteen to twenty feet with ease.

Being very like extremely ugly humanity, the Dyaks consider them as degraded men, and they give an excellent reason for their human ancestors having left their habits and dwellings. They did not like to pay taxes, so they took to the woods!

It is said that when the ambassadors of Tippoo Saib came to Paris to urge the French to take up his cause against the British in India, they were immensely delighted with the Monkeys with the great noses which were preserved and stuffed in the museum, acknowledging them as compatriots. But as a matter of fact, specimens of this Monkey never had been and never could have been seen by these men, for it does not inhabit the peninsula of India. But it is a fact that when some specimens came over to Paris, preserved in spirits, they excited a wonderful commotion amongst the savans. Broderip was present, and saw one drawn forth, "looking like one of those horrible female fiends sometimes pictured in old woodcuts.

"Not uglier follow the night hag."

A celebrated French naturalist, who was present at the opening of the casket which contained this zoological jewel, was in raptures, and as the bust emerged he uttered an exclamation significatory of her paternity. We looked in vain for the young imps, which had probably escaped when their poor barrelled-up mother fell. It must be startling to look round in the wilderness of Borneo and behold one of these horrible visages peering, Zamiel-like, from behind the trunk of some dark tree! The impression left on the mind, however, is rather of the comical than of the terrible in its nature after

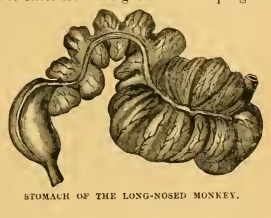
seeing these creatures; but one is obliged to admit that those who see a use in everything may be puzzled to account for this superfluity of nose, for this greatest of all noses does not appear to be like that of the Wolf in Little Red Riding Hood, "all the better to smell with."

But some philosophy may be got out of this nose, and it tends to humiliate the pretensions of those anatomists who can restore an animal if they can only get hold of a bone or two.

This nose is an anatomical excrescence: cut it off, and no bones are cut through; dissect the skull, and then no one could tell that there ever had been such a feature attached to it. The dry bones show no sign of what was during life, and the skull resembles those of the other Semnopitheci. So that animals with the same shaped bones may have very different coverings, and no one could restore the nose of this creature out of his inward consciousness any more than he could imagine, from the back-bones of the animals, that camels and dromedaries have humps thereon.

The animal has a huge air sac, which appears to be single, and to enter the windpipe above the larynx cartilage, and between it and the bone of the tongue. It opens into the membrane which connects these structures (the thyroid membrane) on the left side, and the opening can be closed by the contraction of the muscles which reach from the tongue-bone (os hyoides) to the larynx cartilage (thyroid cartilage—the thyro-hyoid muscles).

But the most interesting part of the internal construction of Nasalis is the great stomach, which does not consist of a simple bag, with an opening for the food to enter from the gullet and œsophagus or food pipe, and with another at the opposite end to carry the digested food to the intestines, but is complex, there being three bags united together. The first two of these bags are for the storage and reception of food, and the other, which ends in the canal leading to the intestines, is for its digestion. This compound stomach is peculiar to the Semnopitheci and the Colobi amongst the Monkeys. It exists in the most perfect form in the animals which chew the cud or ruminate, such as oxen. It is noticed also, more or less, in the Cetacea, or Whale tribe, in the Sloths, in the Cony, or Hyrax, in the fruit-eating Bats of the genus Pteropus, and finally in some Kangaroo-like animals. It is possible that the Semnopitheci may bring back more food into the mouth and chew it again, or the first two expansions of the stomach may be really simple receptacles and storehouses grown in the place of the cheek-pouches; or the condition may be a reversion, or going back, to the condition of some remote ancestor.



STOMACH OF THE LONG-NOSED MONKEY.

The large intestine is also very bulged out here and there, and this and the large stomach occupy much space in the cavity of the belly, compressing the bowels within smaller bounds than in the larger Monkeys.

Bezoars are found in the sacs of the stomach of the different kinds of Semnopitheci, and were and may be still much prized. They are potent charms and remedies against poisons, and are supposed to possess extraordinary virtues. The name comes from the Persian, writes the learned author of the article "Bezoars," in the "Penny Cyclopædia"—*Pèd-zahr*, expelling poison, the expeller of poison. "Pèd" is relieving and curing, and "Zahr" is poison. Bezoars are sometimes found in various parts, but chiefly in the stomachs of land animals. They are either natural or artificial, and as they are rare, they are worth many times their weight in gold. Those which were most esteemed in Europe came from the East, and were the earliest used. The most highly prized came from the stomachs of the wild goat of Persia, and they were called by way of eminence, *Lapis Bezoar Orientalis*, and all such things which were supposed to be antidotes were called *Bezoardic*. They are still esteemed in the East, but have long fallen into disuse in Europe, the chemist and the naturalist having abolished their value by exposing their real nature. They are the round hard balls which are found in the stomachs of many animals, and which consist of hair licked off and swallowed, and food of every clinging nature cemented together by mucus. They get too large to pass out of the stomach, either by vomiting or by going through the small canal into the intestine, and therefore become round by being rolled about, and often very great. Very large ones are discovered in some horses which are found at work near flour

and bran mills. The Americans got theirs from the Llama, and they consisted principally of phosphate of lime. Perhaps the earliest of all physics was bezoardic, and it consisted of the heart and liver of vipers, pounded up for the benefit of the invalid. Fortunately, bezoars disappeared from the list of useful drugs years ago, with the crabs'-claws, oyster-shells, powdered centipedes, and other medical delicacies with which our forefathers were drenched in good faith and *secundum artem*.

SUMATRA MONKEY. (*From Temminck.*)

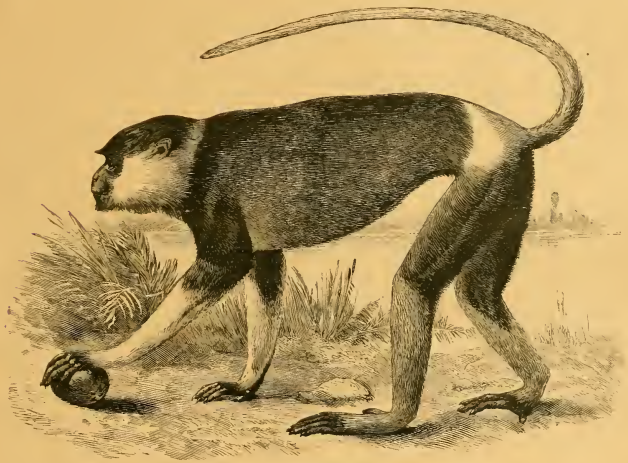
THE HOONUMAN MONKEY.*

This is the most sacred of the sacred Monkeys of the Hindoos, and when full-grown, measures four feet and a half in length, and the tail is considerably longer than the body. An ashy-grey tint distinguishes the upper part of the body, and it is darkest on the tail, which is of equal thickness throughout. The rest of the body is of a dingy yellow colour, or rusty brown, and the arms, hands, and feet are dusky black. The long face is blackish; and above the eyebrows is a line of long stiff projecting black hairs. A greyish-white beard passes round the face, and extends upwards, and is

* *Semnopithecus entellus.*

thicker in front of the ears, which are long and prominent and black. Finally, this face has a few hairs by way of a beard beneath the chin, which projects.

A long-legged, active creature is the Entellus. It associates in great troops, and they keep up a constant noise and quarrel. Those that abound—thanks to the belief in their semi-divinity by the Hindoos—near towns and plantations are certainly more sharp, clever, and impudent than their less fortunate fellows. They watch and steal with impunity and ability, and are amusing when young, but savage and disagreeable when old. The young differ much in shape from the old adults, and their limbs seem very disproportioned at first. They have a staid look about them, and a tranquil eye, and the forehead is broad and high, the muzzle only slightly prominent, and the brain-case large. But



DOUC.

with age this alters; the tints of the body get darker, the body larger, the muzzle elongates, and the forehead appears to contract, and to be no longer an object of human resemblance. The disposition changes also, for the tame and amusing young learn a number of tricks and are full of fun; but this is succeeded by a look and behaviour of distrust and fierceness.

The Entellus Monkey is not found from Cape Comorin to the Himalayan Mountains, as is usually asserted; and Captain Hutton has shown that it is "entirely and absolutely restricted, within narrow limits, to the hot tropical plains of the north-western Gangetic provinces, where, from the degree of protection which its imputed 'odour of sanctity' is so well calculated to cast around it, as well as from the numbers in which it frequently occurs, it becomes a perfect nuisance in those parts of the country where the superstitious veneration for it most strongly prevails. In many places where the natives, from religious motives, are in the habit of feeding and protecting them, the roofs of the village huts are at certain hours of the day literally crowded with them, and the depredations committed in grain shops, gardens, and among neighbouring crops, are most miscreant-like." The Entellus has been purposely introduced elsewhere, but is naturally confined to the right banks of the Ganges and Hooghly. They will not cross water of their own accord, and there appears to be a notion in the minds

of the Hindoos that if there are males on one side and females on the other bank of the river, and plenty of boats between, the sexes will never mix, but that the males have great fights together. This is, however, one of the many fictions of those races who rarely study Nature. Some of these Monkeys were introduced to Kishunghur, in Lower Bengal, across the rivers, by devotees, and the offspring of one pair increased to such an extent as to become a perfect nuisance, so that in 1867 a large number of the native community presented a petition, praying that measures might be taken by the municipality to destroy some of the too numerous Monkeys that infested the station, causing fearful havoc among the fruit and grain. An order was issued, and 500 were killed. "There must be many thousands," wrote a correspondent of the *Delhi Gazette*. This act was soon succeeded by another petition from a different section of the native population for the cancelment of the order to kill what they called their long deceased ancestors. The Entellus is not found in Africa, nor amongst the Himalayas; neither does it migrate from the upper to the lower districts of Bengal at special seasons. The Himalayan Semnopitheci are the Langoor and another—the *Semnopithecus pileatus* and *Semnopithecus barbei*.

It was stated formerly that the Entellus could be seen on Simla all the year through; but when the snow falls during the winter it seeks a warmer climate in the depths of the Khuds, returning again to the heights as it melts away. They may be seen, however, on a fine sunshiny day, even with the snow on the ground, leaping from tree to tree up and down a hill in Simla, which is at about an elevation of 8,115 feet. All this is a mistake; and it is the Langoor, not the Hoonuman, or Entellus, which does all this. It is the Langoor Monkey which Dr. Royle saw at an elevation of 9,000 feet during the summer months, and which Captain Hutton observed when on Hatu mountain, close to Simla, at an elevation of 10,650 feet, and at Simla during winter with snow four or five inches deep, and frost at night.

Whether the Entellus is found in the Deccan, and to the south, appears to be matter of doubt, but probably the long-tailed Monkeys, seen in multitudes near houses or only in the forests, belong to a Semnopithecus closely allied in shape and ornamentation to it. One, the *Semnopithecus Johnii*, rarely leaves the forest lands, and is seen in Malabar.

Evidently the natives do not discriminate between the species and the varieties of it, as we may. They consider all of them possibly to be endowed with the mind of an ancestor, and that it may be their lot to have their soul placed within the body of some Monkey or other.

They attribute to the Hoonuman the stealing of the delicious fruit the mango, and its introduction into Hindostan; but the legend asserts that the hero Ape who did this, stole the fruit from the garden of a giant, who lived in Ceylon, and that afterwards he resolved to set fire to Ceylon, and destroy his enemies by a lighted tar-barrel tied to his tail; but he burnt his hands and feet black, and they remain so to the present day. Unfortunately for the truth of this legend, the Entellus never was in Ceylon.

The Entellus is occasionally to be seen in the Zoological Gardens of London, but it is a very delicate creature. It likes quiet play and some solemn stillness, and therefore it is not kept with the vivacious African Monkeys, but with the Long-tailed Americans.

One of the most striking of the Semnopitheci is wonderfully like some of the Indians of the far west of America in their war-paint, so far as the head is concerned. This is

THE CROWNED MONKEY.*

Its colour is brown, becoming very dark and almost black on the back, loins, and outsides of the thighs, and around the fore-arms and lower leg. The muzzle is rather prominent, and there is a white patch over the nose on the forehead. The crest of long hair sticks up like that of a Cockatoo, and is rather brushed backwards, whilst a whisker, which is continuous with it, comes forward and hides the cheeks.

All the proportions of the limbs are those of the genus, and the tail, which hangs down, is long and slender. It comes from Borneo.

* *Semnopithecus frontatus.*

THE RED SEMNOPITHECUS.*

This is an active little Monkey, and a great tree climber; it greatly resembles the last in shape, but it has a shorter muzzle, and the whole body is a bright reddish-brown, the face being blue and naked, the eyes hazel. A crest of hair sticks up on the top of the head, and the bulk of it points backwards, whilst the front comes over the forehead like thatch, and the whiskers are brushed outwards. It is called Kalassi in Borneo.

This diversity of colouring, which must astonish every one who has seen Temminck's beautiful plates of the Semnopitheci, must be received cautiously as a proof of the different colours meaning different kinds. For in Semnopithecus chrysomeles the male is dark brown, and only lighter in tint underneath, whilst the female is light brown, with a splash or two of black on the front legs. They both have blue faces. In this instance the female and the male might have been called by different names. The same thing occurs in the Sumatran Monkey, in which the female is light brown and the male is a most extraordinary-looking yellow. His hair seems brushed back most violently, the blue face is very short and straight; he has a reddish chin, a white throat, inside of arms, and legs, and belly, and under part of tail, but all the rest is black, with a shade of lighter tint behind the ears and on the back.

All these are very curious-looking when young, for then the head appears too big for the body, and the stomach is always large; moreover, the little Proboscis Monkey looks like a boy with his hair parted down the front, and who has a blue face and a tail.

THE DOUC, OR VARIEGATED MONKEY.†

This Monkey is perhaps the most gaily clad of all this group, and in this departs in a most marked manner from the dull sameness of the fur of the Apes already described in the former chapters. Not only is the long hair very different in colour in several parts of the body, but the hairs themselves are variegated, having bands of various tints upon them, differing thus from the whole-coloured hairs of the great Apes.

The animal has the usual shape of the Semnopitheci; but the whiskers brushed back, as they appear to be, make the naked and orange-coloured face look broad. These whiskers are long, and are of glossy whiteness, and above they join the hair of the forehead, which is black in front, gradually becoming grizzled grey. This is the tint of the head, and of the back of the neck and back. The thighs, fingers, and toes are black, the legs and ankles are bright red, fore-arms, throat, and underneath the legs, the buttocks, and the tail are pure white, and the white throat is surrounded by a more or less complete circle of bright red. They live in the woods of Cochin China, and have been met with not far from the coast. They assemble in troops, but appear to be good-tempered and easily frightened, and this appears to be all that is known of their nature. But they yielded to the researches of the anatomist the same internal arrangement of the cavities of the stomach which has been noticed in describing the Long-nosed Monkey.

THE BLACK-LEGGED DOUC.‡

The forests on the banks of the Me-kong, near Saigon in Cochin China, are tenanted by a fine Douc which, instead of having the red legs of the true Douc (*Semnopithecus nemæus*), has them of a black colour from the root of the tail to the tips of the toes. Moreover, in this animal the fore legs are greyish-black, dotted with white, whilst those of the other Douc are whitish. Of course these distinctions are not sufficient to separate these Doucs specifically, and they must be considered races or local varieties, the black-footed one living more to the south than the other. If this be correct, and it must be on the principle that a negro and a white man are only races of the genus Homo, and that a black and a white rabbit are of the same kind, colour is a point of little importance.

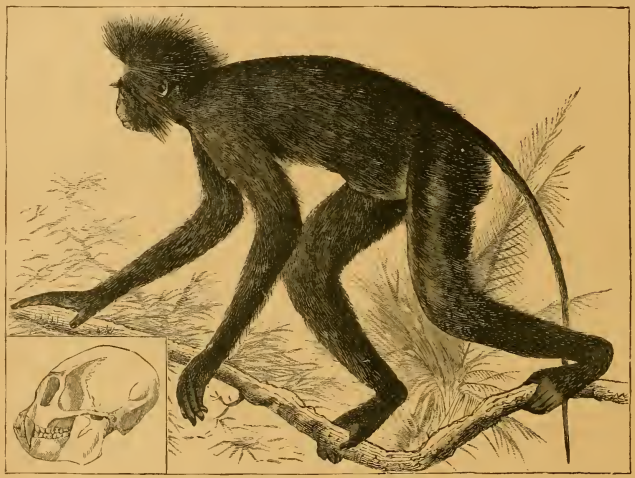
The Black-legged Douc has its face almost naked, and surmounted by a band of hairs on the forehead. These stand out, and are directed forwards. In the other Douc these hairs, of a less black

* *Semnopithecus rubicundus.* † *Semnopithecus nemæus.* ‡ *Semnopithecus nigripes.*

tint, are brushed, as it were, backwards. Now, an attempt has been made by Geoffroy St. Hilaire to arrange the kinds of Semnopitheci by the direction and peculiarities of their head-dresses, and if this plan were carried out the true Douc would be in one section—that of those with the hair brushed back—and the black-legged one, which is only a variety, and not a separate species, would have to be placed in another. Hence, this plan is worthless.

This Douc has a very human face and a small head, a large chest, a thin abdomen, very long hind-legs and tail, and short fore-legs.

The skull of the Douc has large and open orbits, faint side crests, and faint crests passing from the ear over the occiput. The face is small in relation to the brain-case, and the shape of the



CROWNED MONKEY.

whole differs greatly from that of the Troglodytes in this respect. The lower jaw is angular behind, and the portion (the ascending branch or ramus) which leads up to the joint is very straight. The teeth in it are of the same number as those of the Gibbons; but the last grinder is long, and has a very distinct heel-like back, point, or cusp. The other four points, or cusps, are placed two in front and two behind them, those in front are united by a cross ridge, then comes a hollow across the tooth, and then the back pairs, which are united by a ridge, and then the heel follows. The other crushing molar teeth have four cusps, in pairs, each pair having a common cross ridge, and the pairs are separated by a furrow. The teeth are close together, and the first false molar is smaller than the second. The upper jaw projects a little, and the front jaw-bone (pre-maxillary) remains distinct. Its crushing teeth have four points, or cusps, but the outline of the teeth is not straight at the sides, but doubly curved, so that the entrance of the curves is between the cusps, and it corresponds to the furrow. All this gives a very animal look to the teeth.

It must be remembered that these teeth are used more for crushing soft vegetable matters than for cracking nuts, and things which can be stowed away in a cheek-pouch and devoured at leisure. Hence the difference between the teeth of these and of the Macaques.

THE CEYLON LOW-COUNTRY WANDEROO—THE WHITE-BEARDED MONKEY.*

"When observed in their native wilds," writes Sir James Emerson Tennent, "a party of twenty or thirty of these creatures are generally busily engaged in the search for berries and buds. They are seldom to be seen on the ground, and then only when they have descended to recover seeds or fruit that have fallen at the foot of their favourite trees. In their alarm, when disturbed, their leaps are prodigious, but generally speaking their progress is made not so much by leaping as by swinging from

PRIAMUS MONKEY. (*After Tennent.*)

branch to branch, using their powerful arms alternately, and when baffled by distance, flinging themselves obliquely so as to catch the lower boughs of an opposite tree, the momentum acquired by their descent being sufficient to cause a rebound, that sends then again upwards, till they can grasp a higher branch, and thus continue their headlong flight."

This Monkey is very active and intelligent, and is not very mischievous, and, indeed, is much less so than the other Monkeys of Ceylon. In captivity it is remarkable for the gravity of its behaviour, and for an air of melancholy in its expression and movements, which is completely in character

* *Semnopithecus Nestor.*

with its snowy beard and venerable aspect. Its disposition is gentle and confiding; it is in the highest degree sensible of kindness, and eager for endearing attentions, uttering a low plaintive cry when its sympathies are excited. It is particularly cleanly in its habits when domesticated, and spends much of its time in cleaning its fur, and carefully divesting it of the least particle of dust.

The Nestor is about sixteen inches in length (the body and head), and the tail measures twenty inches. The prevailing colour is a deep grey, with a slight tinge of brown, becoming paler on the back of the neck and on the tail, where the previous tinge is more marked. The hands and lower pa. of the limbs are nearly black. Its lips, chin, and whiskers are nearly pure white, the tips of the latter, which are brushed backwards, being grey. There is a stiff ridge of black hairs over the eyebrows, and they are about an inch and a half in length. The moderate length of the hairs, the light colour and the white of the lower sides of the face, are distinctive. It inhabits the southern and western provinces of Ceylon, and is found at a higher elevation than even 1,300 feet.

THE MAHA, THE GREAT WANDEROO.*

This is a larger Monkey than the last, and lives in the hills higher up the country of Ceylon than the Nestor. It is wilder and more powerful than its lowland neighbour, and is rarely seen by Europeans. It clings to the deep woods, and seldom approaches the few roads which have been made through these solitudes. There is a good deal of the Bear in its general appearance, and Major Forbes, travelling in Ceylon, noticed this first of all. He says:—"A species of very large Monkey, that passed some distance before me, when resting on all-fours looked so like a Ceylon Bear that I took him for one." Hence the name Ursinus.

Another very rare Monkey in Ceylon is, for some hidden cause, named *Semnopithecus Thersites*. Thersites was the most ugly and the most impudent talker of the Greeks before Troy, and probably this Monkey is ugly and impudent in the extreme. It is deficient in the head-tuft, which adds to the beauty of the genus; but its temper is good, and it is grateful. One which was caught was fond of being noticed and petted, stretching out his limbs in succession to be scratched, drawing himself up so that his ribs might be reached by the finger, and closing his eyes during the operation, evincing his satisfaction by grimaces absolutely ludicrous. He was fond of fresh vegetables, plantains, and fruit, and ate freely of boiled rice, beans, and grain.

The last Ceylonese Monkey to be noticed is the *Semnopithecus Priamus*.

It inhabits the northern and eastern provinces, and the wooded hills which occur in those portions of the island. In appearance it differs both in size and in colour from the common Wanderoo (*S. Nestor*), being larger and greyer, and its habits are much less reserved. Where the population is comparatively numerous, these Monkeys become so familiarised with the presence of man as to exhibit the utmost daring and indifference. A flock of them will take possession of a Palmyra palm, and so effectually can they crowd and conceal themselves among the leaves that, on the slightest danger, the whole party becomes invisible on the instant. The presence of a Dog, however, excites such an irrepressible curiosity, that, in order to watch his movements, they never fail to betray themselves. They may be seen frequently congregated on the roof of a native hut; and some years ago the child of a European clergyman having been left on the ground by the nurse, was so teased and bitten by them as to cause its death. The Ceylon people hold the singular belief that the remains of a Monkey are never found in the forest—a belief which they have embodied in a proverb, that "He who has seen a white crow, the nest of the piddybird, a straight cocoa-nut tree, or a dead Monkey, is certain to live for ever." "This piece of folk-lore has evidently reached Ceylon from India," writes Sir J. Emerson Tennent, from whose work the extract is taken, "where it is believed that persons dwelling on the spot where a Hoonuman Monkey (*Semnopithecus entellus*) has been killed, will die, and that even its bones are unlucky, and that no house erected where they are hid will prosper. Hence, when a house is to be built, one of the employments of wise men is to ascertain by their science that none such are concealed; and Buchanan observes that it is perhaps owing to the fear of this ill-luck that no native will acknowledge having seen a dead Hoonuman."

Sir J. Emerson Tennent describes the method in which these Priamus Monkeys attack a garden,

* *Semnopithecus ursinus.*

which is quite after the fashion of modern human military tactics. A green sward separated the garden of one of his friends from the jungle, and across this a single Monkey would cautiously steal about twenty paces, and halt to assure himself, by eye and ear, that all was safe. Presently a second would venture out from the trees, pass in front of the first, and squat himself after making another reconnaissance. A third and a fourth would then stealthily approach, always gaining an advance beyond the last vedette, and finally the whole body, having ascertained the absence of danger, advanced hastily but noiselessly to the enclosure; and having with infinite rapidity secured a sufficient supply of fruit, the troop dispersed simultaneously, with a rush and an exulting scamper, conscious that caution was no longer necessary. Possibly this Monkey becomes occasionally an albino, for white Monkeys having the general shape of the Priamus are captured every now and then not far from Colombo; and Spence Hardy mentions, in his work on "Eastern Monachism," that on the occasion of his visit to the Great Temple of Dambool he encountered a troop of white Monkeys on the rock on which it is situated.

In the Semnopitheci and in the species of the next genus (Colobos) the face is long, the forehead rounded, and there is a decided angle to the jaw, so that the facial angle is considerable.*

GENUS COLOBOS.†

All the Monkeys of the genus Semnopithecus which have been found by travellers and naturalists live in Asia and its islands, and thus their geographical limit is precise. Now, there are some Monkeys which resemble them in most points, and which are only found in the forests of tropical Africa; that is to say, in Abyssinia on the east, and from Gambia to Angola on the west. They are also found on the Island of Fernando Po. These have the thumbs of the hands extremely small, and they are but mere useless projections. They are Semnopitheci without thumbs, and the Greek word κολοβός ("docked or stunted") has been used to designate them.

The kinds of Monkeys included in the genus Colobos are not very numerous, and they are interesting more on account of their beautiful skins, which form ornaments and articles of commerce in Africa, and for those suggestions which must occur to the mind of every one who thinks a little about natural history, regarding the cause of the absence of such an important structure as the thumb in a group of animals, whose other characters are similar to those of a genus possessing it. Very little is known about their habits in a state of nature, and few have ever been brought alive to Europe.

The thumb is not seen in the least in one kind of Colobos, the true Colobos (*Colobos verus*); in others it is like a little knob, but in none is it of any use. In the corresponding member of other Monkeys there are three bones, one placed before the other. The first, the metacarpal, is the nearest the wrist, and is jointed to the wrist-bone called trapezium, and in front it is in contact with the second bone, or the first phalanx of the thumb. This is ended by the second phalanx, which bears the nail. These are terms used by anatomists, and the word metacarpal means "the next in order of rank to the wrist." These metacarpal bones intervene between the knuckles and the wrist, and are long and parallel with each other, there being five in the hand. They are not usually very movable on the wrist, but that of the thumb is, and they have a joint at the further end which unites them with the so-called internode or phalanx-bone, No. 1. The word internode means between joints, and the term phalanx is one of those unmeaning applications of Greek terms which abound in anatomy. The phalanx was an order of battle, and means rows placed in parallel order: the internodes of the fingers, when in place, are one before the other and side by side, like the soldiers in the Greek order of battle. Each phalanx represents a bone: there are two in the thumb, and three in the other fingers. In the Colobos there is a joint on the wrist-bone for a thumb, but no thumb exists, but there is just a little vestige of a bone, and it is probably the first phalanx, or internode, and not the metacarpal.

The thumb is therefore "rudimentary" in the genus Colobos, and why? The animals are tree-climbers and active jumpers, and can run very well on all-fours; in fact, their method of life

* The kinds of Monkeys included in this genus have a very wide geographical range. Mr. Wallace states that a species has been seen at an altitude of 11,000 feet in the Himalayas; and *Semnopithecus roxellana*, which resembles a young *Semnopithecus nasalis*, occurs in Eastern Tibet (about lat. 30° N.) in the highest forests. Elsewhere, they extend over the forest land of the Oriental region of natural history.

† Thumbless Monkeys.

and of motion is that of the Monkeys which have well-formed thumbs. The notion of a useless organ is at first repulsive to our ideas of the benevolent scheme of Nature. Mr. Darwin writes, "In reflecting on them every one must be struck with astonishment; for the same reasoning power which tells us plainly that most parts and organs are exquisitely adapted for certain purposes tells us with equal plainness that these rudimentary or atrophied organs are imperfect or useless." Let us take a well-known instance of such a structure: the Calf when born has cutting teeth in its upper jaw hidden in the gum; they are not in sockets, and even if they were, they would be of no use in biting. The Ox has no cutting or incisor teeth in its upper jaw, as every one knows, and the tongue touches a hard and moist gum there. The incisor teeth of the Calf are never cut, but they are gradually absorbed in the gum with age. Now what is their meaning? They are of no use in sucking, or in

COLOBUS VERUS. (*After Van Beneden.*)

anything which occurs in the early life of the animal: they are clearly useless and rudimentary or atrophied structures. Take another example: the little Kiwi bird of New Zealand has no wings with which to fly, yet the bones are there in a dwarfed and rudimentary condition; many insects have no wings, or have them so reduced in size that they are of no use in flight, and sometimes the males have them in perfection, and the females have none. In explaining this subject two courses are open, first, to beg the question, and to say that the design of the Creator was thus; or to account for it on the principle that the Creator acts by law, and that creatures become modified and altered by inherent power, and by having to obey the force of surrounding circumstances generation after generation.

In the instance of the male and female insect just noticed, the male is active, and has to search for his partner, and the female is a stay-at-home, and expects to be courted, and when mated to do nothing more than lay eggs. Her wings would be of doubtful value. We may believe, then, that *disuse*, generation after generation, gradually weakened the wing, and finally Nature, ever economical in not-used organs, did not perpetuate it. Disuse may be therefore considered as the principal cause of the atrophy, rudimentary condition, and of the final deficiency of structures. But disuse will not produce this in one generation, but in many, so it is necessary to look farther back into the ancestry of

the creatures which have rudimentary organs. The four-legged ruminating or cud-chewing animals have bones and feet of peculiar arrangement, and there is no difficulty in at once knowing a ruminant by its bones. Now, in former ages, and before there was a trace of man on the globe, there were ruminants, as known by their bones found in strata or deposits, and they had incisor teeth in their upper jaws when full grown, and not only when in the calf condition. The inference to be drawn is, that the modern Oxen are the descendants of those ancient forms with incisor teeth, and that disuse, probably produced by the introduction of grass-feeding on a grand scale, instead of leaf- and bud-nibbling, gradually diminished the strength and permanence of the front upper teeth, and finally only left the simple traces of them which we have mentioned. Disuse by ancestral forms, by the forefathers, and the carrying down the weakened and atrophied state of the structure or organs,

GUEREZA.

are the most important considerations in any attempt at the explanation of the seeming paradox. In endeavouring to apply this style of reasoning to the Colobos group—the Semnopitheci without thumbs—it must be asked, is there any evidence of the great antiquity of these Monkeys, and are there any evidences of anything wrong about the thumbs of their Asiatic allies?

It is remarkable, and bears strongly upon this point, that some of the fossil remains of animals found in India, on the flanks of the Himalayan Mountains, have a closer resemblance to a large Semnopithecus Monkey than to any other, and to one belonging to a kind much like the Entellus. The bony remains were found in collections of shingle, clay, and sand of great depth, and which included also the remains of the bones of Elephants, Giraffes, Hippopotamidæ, Crocodiles, and fresh-water Tortoises, and other land and fresh-water creatures. The deposits had accumulated in lakes and swamps in the plain near the distant flanks of a low range of hills, the ancient foundations of the present great snowy range, and then upheaval took place, which gave the very home of snow (Himalaya) its present vast altitude. The plains, lakes, and swamps were lifted up and tilted, and their relics are now found resting at a considerable angle on the main chain, and covered and folded over by the pressure exercised during the marvellous change in the physical geography of the district. Semnopitheci lived in India, then, before the Himalayas were a great chain of mountains, and they lived with animals which were African as well as Asiatic in their character. The vast age of the

groups of Monkeys must be admitted, for the Himalayas are as old as the Alps, and as both have been worn down into their present condition of peak, pass, and valley since they were uplifted, their age is incalculable by years. The former connection of Africa and Asia by means of intermediate land, which is now the floor of the Indian Ocean, to the west of Hindostan, may be reasonably asserted to have been severed at the same time when the mountains far away to the north-east received their breadth and height. So that before these great terrestrial changes occurred, Semnopitheci could have either an Indian or an African home. Disuse of the fore-thumbs in branch-crawling or swinging may then have commenced before that geological age in which these things happened, and it may have progressed very decidedly in Africa, and not so much in Asia. Hence the Semnopitheci here have rather small thumbs, and the African groups, separated by the physico-geographical change, and disusing generation after generation, have gradually lost the structure.

The Colobi resemble the Semnopitheci in the construction of their compound-looking stomach.

THE GUEREZA.*

There is something very un-monkey-like in the shape of this Abyssinian animal, for it has long white hair, resembling the edge of a cloak, along its sides, and a long tail with a tuft to it. The natives chase it, and are fond of having some of their long hairy skins to cover their shields with. Assembling in little troops, the Guereza keeps well up in the tallest trees, in the neighbourhood of running water. They feed on fruit, grain, and insects, and are inoffensive and wild. The fur is certainly very prettily arranged, and the black and white truly oppose each other well. The colour of the fur of the head and of the greater part of the body is black, but the forehead is white, so are the sides of the face, the throat, and the sides of the neck. There is a mantle-like mop of long hairs starting from the region near the ribs, and the lower part of the back, and covering the flanks in a train behind. It is of a white colour, and exists in both sexes; nevertheless, it is longest in the females and adults. The tail is white, hairy, and tufted.

Another of the Colobi has a very dignified look given to it by a large mass of hair which covers its neck and shoulders like a little cloak. It has slim legs and a long tail. For some reason or other the natives in the neighbourhood of Sierra Leone call it the King of the Monkeys. The face and limbs and body are black, and a great mass of hair starting from the forehead and brushed back from the sides of the face and chin, the neck and shoulders all round, falls down on all sides. This is of a dusky yellow colour. The tail is white. It is called the Cloaked or Many-haired Colobos (*Colobos polycomos*).

As if to contrast kinds of the genus Colobos, which have great general resemblances, Nature has provided some with red-coloured fur, instead of black and white; for instance, the Bay Monkey (*Colobos ferrugineus*); and finally, one very interesting species which, like all those mentioned, except the Guereza, comes from West Africa; it has a short fur of an olive colour, with a grey tint beneath and on the limbs. It has no long hairs on the body, and its tail is long and thin. This *Colobos verus* has not a vestige of a thumb. There are eleven species of this genus.

Besides the fossil Semnopithecus found in the Himalayas others have been discovered in Greece, Würtemberg, and at Montpellier, and in strata of Mid-Tertiary and of Pliocene Age.

* *Colobos guereza.*

CHAPTER VI.

THE DOG-SHAPED MONKEYS (*continued*). THE GUENONS.*

THE GUENONS—Where they are Found—Early Notices of them—Resemblance to the Colobi and Macaques—Distinctive Peculiarity of the Group—Often seen in Menageries—Their Terror of Snakes—Peculiar Expression of the Face—Beauty of their Skins—Minor Divisions of the Guenons—THE DIANA MONKEY—Origin of the Name—Anecdotes of their Mischief—THE MONA MONKEY—Description of one at Paris—THE WHITE-NOSED MONKEY—Origin of the Name—THE TALAPOIN—Anatomical Peculiarities—THE GREEN MONKEY—Found in Senegal in abundance—THE RED-BELLIED MONKEY—THE RED MONKEY—Observed by Bruce—THE MANGABEY—Singularity of its Appearance—Special Structural Peculiarities.

THERE are vast numbers of Monkeys living in the African forests which resemble, to a certain extent, those described in the last chapter, but which have such important differences in their construction that they are separated from them, and collected in another genus. They are said only to range in Abyssinia to the Zambesi and from the Gambia to the Congo, but probably all the equatorial parts of the Continent are frequented by them, and they extend far south. They are not found in Madagascar, and, of course, they do not frequent desert places or rocky treeless districts.

Being very numerous, and extremely impudent, as a rule, and full of grimace and mischief, they soon attracted the attention of the ancients, and the beauty of the fur of some made them all the more prized. Hence they were caught, figured, and sent as presents to distant kingdoms. The ancient Egyptians knew of one, which at the present time is found in Nubia, and which is often brought to Europe, being called the Grivet. They engraved it in the catacombs of Ghizeh, whence the figure was described by Denon, and Ehrenberg and De Blainville have drawn it as represented mounted on the long neck of a Camelopard. Many coloured drawings of Egyptian origin also represent a Monkey on all-fours, with a tail curved over its back, and this is probably one of those about to be considered.

They are still called *Keb* or *Kep* in the East of Africa, and they are doubtless the κῆβοι of the Greeks. Aristotle says for certain that the Cebus, as it was translated by the Latins, is an Ape with a tail.

Modern naturalists, having become acquainted with many of these species closely resembling each other in some important particulars, have arranged them all under the term Cercopithecus from κέρκος (a tail), and πίθηκος (an ape). The grimaces and odd gestures of these Monkeys have given to them the name of Guenons, and this term is now used accordingly.

At first sight they resemble the Colobi, inasmuch as they have long bodies, long hind legs, and long tails, but the fore limbs are short in the Guenons, and the tail, which is as long or longer than the body, is stout and not slender. Moreover, they have well-made and exceedingly useful cheek-pouches, besides the callosities behind. The face of the Guenons is long, and rounded, and the eyes are somewhat prominent. On examining the inside of one of these particularly African species the stomach is found to be single, and not to resemble that of the genera last described, and on looking at the lower jaw it will be found that the last crushing teeth on each side have only four points, or cusps, and not five, as in Semnopitheci. The wearing of the first premolar tooth next to the lower dog tooth, and behind it, resembles somewhat that noticed before, and which will be described in treating of the Inui, or Macaques, in the next chapter. The hands and feet are well grown, and the thumbs are long and useful.

So that the distinctive peculiarity, or what is called the *diagnosis* of the group, or genus Cercopithecus is—Monkeys with long hind and short fore limbs, and with long tails, cheek-pouches, single stomachs, and callosities, there being only four cusps on the last lower molar teeth.

Many of the Guenons are often seen in menageries and zoological gardens, or as the more or less unwilling companions of organ-grinders; and their trick of crowding everything into their mouth,

* *Cercopithecus.*

and allowing it to distend the cheeks, is sure to be noticed. The quantity of nuts which can be stored away is enough for a good meal; and hence these Monkeys are not only good purveyors for themselves, but great rob'ers of the riches of cultivators. In the wild state they assemble in troops in the forest, for they are essentially tree dwellers, and make raids on all sides of their favourite home, moving with such rapidity under the shadow of leaves and boughs that they are rarely seen by men. In their own little tract of forest they are very noisy and restless; they chase away in a body all intruding Monkeys, and whilst the more aged spend their time in more or less restless movement, in occasional family jars,

DIANA MONKEY.

and in picking the insects from their young and from each other, the juvenile part of the troop are full of play, mischief, and wanton aggression upon the quietude of their elders. A Snake may appear, and there is a terrible noise made, and a general rush off out of danger, the little ones clinging to the fur of the mother, and being carried off safely in spite of her bounds and jumps from tree to tree. Or a Leopard may make a spring, and not always fruitlessly, and great is the surrounding howling and grimacing at it. The hatred of Snakes is carried into their captivity; and Mr. Darwin having read Brehm's account of the instinctive fear which his Monkeys had of Serpents, and also of their great curiosity regarding snake-like things and their doings, took a stuffed Snake to the Monkey-house of the Zoological Gardens. The excitement which was produced, he writes, was one of the most curious spectacles ever beheld. Three species of Cercopithecus were the most alarmed. They darted about their cages, and uttered sharp cries of danger, which were understood by the other Monkeys. A few

young Monkeys and an old Anubis Baboon alone took no notice of the Snake. He then placed the stuffed specimen on the ground in one of the larger compartments. After a time all the Monkeys collected round it in a large circle, and staring intently, presented a most ludicrous appearance. They became extremely nervous, so that when a wooden ball with which they were familiar as a plaything was accidentally moved in the straw under which it was partly hidden, they all instantly started away. These monkeys behaved very differently when a fish, a mouse, and some other new objects were placed in the cage; for though at first frightened they soon approached, handled and examined them. He then placed a living Snake in a paper bag, with the mouth closed loosely, in one of the larger compartments. One of the Monkeys immediately approached, cautiously opened the bag a little, peeped in, and instantly dashed away. Then he witnessed what Brehm has described, for Monkey after Monkey with head raised high, and turned on one side, could not resist taking momentary peeps into the upright bag at the dreadful creature lying at the bottom.

It would appear as if Monkeys had some notion of zoological affinities, for those kept by Brehm exhibited a strange though mistaken instinctive dread of innocent Lizards and Frogs.

Birds of prey attack them, and not always with a successful result; and there is a story of a little Guenon being darted at by an Eagle, who swooped down and struck it, but it did not get off, for a rush was made against the bird by several of the active elders, and they not only held it, but nearly plucked off all its feathers, so that when it got away it remembered for ever after the treatment it received. The Guenons are very choleric, and the expression of the face and of the mouth, and the shrill sounds which are emitted when they are angered, would probably be accompanied by extremely bad language were they men; but their rage is soon over, and some mutual tail-pulling and biting are the worst part of it. There is a curious defiant look about the eyes of some, with or without extreme restlessness of them; they seem to be the very embodiment of cunning and sharpness, and this look is really very peculiar to the group. By way of additional force of expression, those which are very fond of fighting with their teeth have the power of drawing back their ears like angry Dogs; and this is done by the action of a muscle which springs from the ear-bone behind the ear, and is attached to it behind. There is just a rudiment of this muscle in man. Usually very good-tempered when young, like all the Quadrumana, they grow cross, savage, and uncertain in temper when old; there are some exceptions to this, but, on the other hand, so savage do some of them become, that breaking or removing their great upper canine teeth appears to be the only way of making them behave at all properly. The loss of these fine weapons of offence has a most humiliating effect on the most insolent and petulant of them. Many are very pretty, and are as elaborately coloured as the Douc, that prince of beautiful Semnopitheci; and this leads to their destruction, for every now and then, besides the native desire to have some fine Monkey skins, European ladies desire Monkey muffs, and many an irascible chatterer out of the woods of Western Africa has its skin paraded by the fashion. Bright red, green, fawn, yellow, and white colours are constantly mixed up with black shades, and every tint of grey is dotted here and there. The hair is longer in some parts than in others, especially about the cheeks and chin; one has a white spot on its nose, another has white moustaches, and a third a white band across the forehead. And these tints, and the disproportion of the long hairs, have served to identify the different kinds.

FACE OF THE DIANA MONKEY.

The Guenons occasionally breed in menageries, and thus opportunities have been afforded of

watching their treatment of, and method of educating, their little ones. One in Paris had three baby Monkeys, one after the other, and succeeded in rearing one, the others dying. She constantly carried it, holding it close to her, so that its little mouth was always close to the breast; but after a while, as it became stronger, it clung on by itself, holding on fast with its hands to the mother's fur, and helped itself whenever it thought fit. Then the mother appeared to pay no especial attention to the little one, and jumped and rushed about as if it had not the little burden. The father was anything but paternal, and boldly neglected the education of his child; in fact, he was quite indifferent to the mother as well, and even behaved brutally by seeking to quarrel with her. Once or twice he maltreated her, and pinched the baby, so he was locked up by himself.

This careless treatment doubtless accounts for the rapid independence of the young of the Guenons, who soon retaliate on their fathers and mothers for all the enjoyments they did not have at their hands, by endless teasings and scoldings. But all Monkeys are not thus unpaternal and unnatural, and the Baboon is singularly affectionate. At the time that the Grivet—the above-mentioned Guenon—was seen in one cage outraging all good feeling, two Chacma Baboons were in another, and the difference in their behaviour was most edifying. In the one cage sat the solitary mother and its offspring, the father having been removed for his bad temper and brutal conduct; and in the other were several male Baboons surrounding two Baboon mothers and their two little ones, caressing the mothers with the most pronounced evidence of tenderness of feeling, taking them in their arms and pressing them to their hearts, and embracing them in a manner quite human. They squabbled about who was to have the pleasure of carrying the Baboon babies, and after having passed them from one to the other, returned each one to its own mother.

As these Guenons walk on all-fours and but rarely take on the erect posture, which, moreover, they cannot maintain, their muscles are not exactly the same as in the Troglodytes and Orangs, but they resemble those of the Semnopitheci. The Guenons, like the Macaques and Baboons—those great runners on all-fours—have a special muscle to assist in pulling the shoulder-blade forward, and thus to assist the forward motion of the body. Then, in order to drag the elbow backwards in moving on all-fours, and to assist also in climbing, one of the large muscles of the back sends a slip to the back of the elbow. Climbing is also assisted by an addition to the gluteal or buttock muscles, which is called the scansorius or climbing muscle. And in the foot the front muscle of the leg has two masses; one sends a tendon which goes to the inner and front bone of the ankle, and the other right under the foot to the inner side of the long bone (metatarsal), which supports the toe-thumb.

The result of its action is to turn in the foot with a view to holding on. Finally, the two long muscles which flex or bend down the toe-thumb and the other toes are not separate, but are connected by their tendons. So that there is not great independence of the toe-thumb, but all the toes act more or less simultaneously very readily. But the other muscles of it give it more mobility than in man. Their muscular energy is immense, and their power of using the thumb is very considerable, and they pick out each other's vermin with well-known ease.

In separating the numerous kinds of Guenons into kinds or species, paying a good amount of attention to their internal as well as external structures, that is to say, to their teeth and skull, as well as to their form, it becomes evident that some large ones form a group which closely resemble the others, but which still have more general likeness to the Monkeys which form the subject of the next chapter—the Macaques. These have been placed in a separate genus, but the necessity for doing so is not apparent, especially when the principles of the true nature of classification have been thoroughly comprehended. So the so-called genus Cercocebus (κέρκος, tail; κῆβος, monkey) is omitted, and the Monkeys included in it by some authors are to be considered as the kinds which link on the Baboons and Macaques to the Guenons. Besides these, some Guenons are stronger and stouter than others, their skins being green, or tinted more or less with that colour, and another is of a bright red colour. So that several sets of the Guenons may be established for the sake of convenience — 1. The smaller kinds usually with prominent white markings. 2. One having a green skin and a black nose, and only three points or cusps on its hind lower molars. 3. The larger kinds with decidedly green tints, one being bright red. 4. And the group often called Cercocebus, which resemble the others, but have a fifth cusp on the last lower grinder on each side.

Amongst the first kind the Diana Monkey is very well known, and visitors to the Monkey-house in

the Zoological Gardens in the Regent's Park usually pay much attention to this most determined and pretty romp.

THE DIANA MONKEY.*

This native of Western Africa inhabits the woods of the Guinea Coast, and of the banks of the Congo, and it is found in the island of Fernando Po. It was known to European naturalists before the year 1700, and it has always been prized for its pretty fur and gay temper.

The goddess Diana has been honoured by being associated with this Monkey on account of a crescent-shaped white band of long hair stretching across the forehead (she being goddess of the crescent-shaped moon). It is about eighteen inches long when full grown, and the tail is longer than the body, and the fur is very pretty. The crescent of white hairs has dark edges, and the top of the head is broad and dull grey, spotted with green; the ears are dark and the face also; and the beard and whiskers are white, and the first of these projects like a goat's. The broad and upper chest is white, and this colour is continued under the arms, which at their termination are black-grey. The middle of the back is a dark red-brown, and the belly is white with orange tints, and these colours are continued down the inside of the thighs. Outside these and the flanks are ash-grey and greenish. As another Monkey from the same region has a white band across the forehead, the Diana has been confounded with it, and hence very different descriptions of the colouring will be obtained by reading different authors, and even F. Cuvier jumbled the Diana and this Diadem Monkey together. Very little is known about them in their wild state, and in captivity they show very adverse dispositions; sometimes they are gay and full of fun, and at others morose and snappish. We once saw one of them in its cage in the Zoological Gardens pull its mate, a small Sykes' Monkey, from the top to the bottom by a well-directed pull of the tail, and the proceeding reminded one of a very energetic mistress, whose servants were inattentive, tugging at a bell-rope. The puller was chattering and grimacing at his visitors all the time that the pulled was hanging on to everything that came in its way during its forced descent; and when it came to the bottom it scrambled about and rushed up to its little house again as if it were a frequent and unwilling exercise. The Diana also stole its companion's food, such as a piece of apple, by putting her arms around its neck, and squeezing the morsel against its nose, so that it was obliged to drop it.

Mrs. Bowditch, in describing her voyage home from Western Africa, gives an interesting account of a Diana Monkey which was on board. "We made acquaintance," she says, "very suddenly, and, to me, disagreeably, for I had not till then conquered the foolish aversion with which these animals always inspired me. It was a dead calm, the wheel was lashed, and all, save myself, below—nothing round us but sea and sky, and I had sheltered myself with a book in a corner protected from the equatorial sun. Suddenly, and without noise, something leaped upon my shoulders, and the tail which encircled my throat convinced me that Mr. Jack was my assailant. My first impulse was to beat him off, in which case I should probably have received some injury; but fortunately I sat perfectly still, and twisting himself round he brought his face opposite to mine and stared at me. I endeavoured to speak kindly to him, upon which he grinned and chattered, seated himself on my knees, and carefully examined my hands. He then tried to pull off my rings, and was proceeding to a bite for this purpose when I gave him some biscuit which happened to lie beside me, and making a bed for him with a handkerchief he settled himself comfortably to sleep, and from that moment we were sworn allies. The amusement afforded to me and others by Jack made him tolerated when his mischievous propensities would otherwise have condemned him to perpetual confinement. He was often banished to an empty hen-coop, but as this made no impression upon him I always tried to prevent it, which he knew so well that when he had done wrong he either hid himself or sought refuge near me. Much more effect was produced by taking him within sight of the Panther, who always seemed most willing to devour him. On these occasions I held him by the tail in front of the cage, but long before I reached it, knowing where he was going, he pretended to be dead—his eyes were closed quite fast, and every limb was as stiff as if there were no life in him. When taken away he would open one eye a little to see whereabouts he might be, but if he caught a glimpse of the cage it was instantly closed, and he became as stiff as before. He clambered into the hammocks, stole the men's knives, tools, handker-

* *Cercopithecus Diana.*

chiefs, and even the nightcaps off their heads, all of which went into the sea. When biscuit was toasting between the bars of the caboose, and the dried herbs boiling in the tin mugs, he would take the former out and carry it away, and take out the latter and trail them along the planks; if he burnt his hands he desisted for a day or two; and he often regaled the Parrots with the biscuit, biting it in small pieces, and feeding them with the utmost gravity. At other times he would knock their cages over, lick up the water thus spilled, eat the lumps of sugar, and pull the birds' tails: and in this manner he killed a beautiful green Pigeon belonging to the steward, a specimen of which I never saw in any collection. For this he was flogged and imprisoned three days; and half an hour after he was let out I met him scampering round the deck with two blue-faced Monkeys on his back, which he often carried about in this manner. When he thought fit to ride, he would watch behind a cask on the days the Pigs were let loose, dart on to their backs as they passed, dig his nails into them to keep himself on, and the faster they ran and the more they squealed the happier he seemed to be. His most important misdemeanours, however, were performed to the injury of his fellow Monkeys, of whom he was very jealous. The smaller ones were very obsequious to him, and when he called them by a peculiar noise, they came, hanging their heads and looking very submissive, and in one week two were drowned out of sheer malice. I saw him throw the first overboard, and the poor little thing swam after us some time, but the ship was going too fast for even a rope to be effectually thrown out in the hope he would cling to it. During one of the calms we so often met with, the men had been painting the outside of the ship, and leaving their pots and brushes on the deck, went down to dinner. No one was above but myself, the helmsman, and Jack. The latter beckoned and coaxed a black Monkey to him; then seizing him by the neck, took a brushful of white paint, and deliberately covered him with it in every direction. The helmsman and I burst into a laugh, upon which Jack, dropping his victim, flew up the rigging into the maintop, where he stood with his black nose between the bars peeping at what was going on below. The little metamorphosed beast began licking himself, but the steward being summoned, he washed him with turpentine, and no harm was sustained. Many attempts were made to catch the rogue aloft, but he eluded all, and when he was driven down by hunger, he watched his opportunity and sprang from one of the ropes on to my lap, where he knew he should be safe. I fed and interceded for him, so he escaped with only a scolding, which he received with an appearance of shame which in him was rather ludicrous."

THE MONA MONKEY.*

The term Mona means tailed Apes or Monkeys, and it has been especially given to one from Senegal, which has some resemblance to the Diana, and it is mentioned here with a view of illustrating its mental peculiarities. They are more beautiful in colour and more elegant in form than the Diana, and they are sometimes more gentle, sagacious, and sharp than any other kind. F. Cuvier describes one which was a great favourite in the collection at Paris. Upon his arrival he was extremely young, and his gentleness and total want of malice and petulance gained him the free range of the apartment. Age did not alter the excellence of his disposition; and as he increased in age and strength, his address and agility became unparalleled. Yet all his motions were gentle, and his actions circumspect; he was persevering in his wants and wishes, but never violent in the attempt to enforce them. When after much solicitation his requests were refused, he would go off in a gambol, and find entertainment in some new object. He had no idea of property, but took every thing that pleased him, even such articles as had previously caused him punishment, and he committed his thefts with dexterity and silence. He would open locks wherein the key had been left, untie knots, open the links of a chain, and search pockets with so much address that you did not feel his hand there, although conscious of the fact that he was thieving. The examination of pockets was his favourite occupation, doubtless from expecting to find food. He was not very affectionate, but when tranquil, and not engaged, he received caresses with pleasure. When tempted to play he signified his assent by many graceful motions; he would throw himself into all sorts of graceful attitudes, bite gently, press himself against you, and give out a gentle cry. He never made grimaces, but, on the contrary, his countenance was always calm, and frequently serious. He looked a perfect angel of a

* *Cercopithecus Mona.*

Monkey in his beautiful fur; his hair was of a brilliant golden green, the back and sides were rich brown, variegated with black, the outer part of the limbs and tail were slate-coloured grey, while the neck, chest, and underneath were pure shining white. He had ears and hands of a flesh-colour, and there was a black band stretched across the forehead, surmounted by a crescent-shaped stripe of grey.

Probably its French education may have had something to do with its politeness and gentleness, for one of these pretty creatures which was kept in the Zoological Gardens was one of the most ill-

WHITE-NOSED MONKEY.

conditioned savage beasts ever seen—quite a diabolical Monkey. This Monkey does not appear to have the air sac in the neck which is common to the Guenons, as well as to the other Monkeys already noticed.

THE WHITE-NOSED MONKEY.*

The word "petaurista" is the Latin for "one that showeth tricks of activity, from a machine suspended," according to old dictionaries, so this Monkey with a white nose has its abilities properly designated. Some call it the Vaulting Monkey, but in the Zoological Gardens its wonderful agility is shown by its scampering up the side, over the top, and down the opposite side of its cage in a kind of continuous somersault. Coming down on all-fours with a bang, it does the same thing over and over

* *Cercopithecus petaurista.*

again to attract attention, and it seems as if it were moving in the inside of a wheel. The dab of white on the nose distinguishes it, and it comes from that paradise of Monkeys the Guinea Coast and the adjoining districts.

The only one of the second group to be mentioned is

THE TALAPOIN.*

This is a rather rare animal, and comes from the west coast of Africa, having been sent to Europe from the Gaboon. It is a pretty little creature (probably the smallest of these Monkeys), and is extremely gentle and intelligent. The skin is green, and the lower part of the body and the under part of the limbs are white. It has large ears, a black nose, and it has a kind of broad "brutus" on the forehead.

There are some very interesting points about this little thing, which, in nearly all its construction, is like the rest of the Cercopitheci, or Guenons, but it has a large brain, a short muzzle, a thick, long partition in its nose, and only three points, or cusps, instead of four, on its last lower hind grinders.

HEAD AND SHOULDERS OF THE TALAPOIN.

So far as is known, there are no differences between the habits of this little Monkey and the others from the west coast of Africa, and therefore its intelligence and deficiencies are sufficiently incomprehensible; but they exhibit a fact of great importance, of which a hint was given in the conclusion of the description of the Mona Monkey. In the Talapoin, the last lower grinder differs from that of all Monkeys by the absence of an important part of its usual structure, and in the Mona the great air sac, which is in communication with the windpipe in most other Monkeys, is absent. This fact may be stated as follows:—That in animals closely resembling others of their group or genus material deficiencies in construction suddenly appear. Corresponding to these deficiencies are the absence of all or a great part of tail in genera the majority of whose species have a tail, and the inference to be drawn is that, notwithstanding all the members or species of a genus are related by a common ancestry, the descendants of a well-marked stock may exhibit peculiarities of structure which are not produced by alterations in the habits or surroundings of the animals.

Such peculiar structures often relate to a remote ancestor, and it is remarkable that in the case of this Talapoin they give it a very faint resemblance to the American Monkeys.

Some naturalists separate the Talapoin from the genus, and classify it in one of its own under the title Myiopithecus.

The third group of the Guenons is represented by the well-known Monkey called

THE GREEN MONKEY.†

It has its classical name from two words which mean beauty and hair (*κάλλος* and *θριξ-τρίχος*), and it must not be confounded with the Callitricha of Buffon, which is the same as the Grivet Monkey whose figure was drawn by the Egyptians.

The Green Monkeys live in Senegal, and extend as far south as the River Niger, for it was on the

* *Cercopithecus talapoin.* † *Cercopithecus callitrichus.*

GORILLA. (*See pp.* 6–39.)

(*From the Living Specimen in the Zoological Gardens, London.*)

borders of that river that Adanson, a French naturalist, noticed their collecting in great troops. The little Monkeys were astonished at his appearance, and as they rushed off into the forest they broke off, either purposely or by accident, little branches from the tops of the trees, whose falling relieved the stillness of the woods. He indulged in some very cruel sport at their expense, for although they had been so silent and noiseless in their gambols, he shot one or two without the others being frightened. But when the greater part were more or less wounded, they began to get under cover from the shot, some to swing behind large branches, some coming to the ground, and the majority jumping from the top of one tree to another. Whilst this little scene (*petite manège*) was going on, this scientific brute still continued to fire on them, and finally he killed twenty-three in less than half an hour. This he did in the space of about one hundred and thirty feet, and yet not one screamed, although they often assembled together, knitting their brows and grinding their teeth, as if they intended to attack him. Broderip, in noticing this, writes, "I wish they had, with all my heart."

They have in common with the other Guenons a fondness for particular parts of their forests, and one band will prevent another from entering its favourite haunts; and this regard for companionship and locality is even seen when they are in captivity. Restless, irritable, and irascible they are ever at play, and fighting among themselves, but they will turn to expel a stranger.

It is said that this Monkey has obtained an American home, and that it was introduced with slaves into the Island of St. Kitts. Many escaped into the woods, and have increased considerably in number, so as often to pillage the plantations.

We introduce a kind here whose elegance of colour is great, principally to give a good notion of the general aspects of the Guenons, when not on all-fours, and also of the furtive look in the eyes of tamed kinds.

THE RED-BELLIED MONKEY.*

When living at the Zoological Gardens, in the Regent's Park, this pretty Monkey, with a red chest and belly, and slim tail, was very timid, but it liked to be petted by the keeper, being somewhat distrustful of its more romping companions. It would take food out of his hand, and seemed pleased, and generally played with, his fingers, without attempting to bite. The canine teeth were very moderately grown.

This Monkey inhabits western Africa, and is at once known by the red belly and chest, the white beard and whiskers, and the black band across the forehead. It has, moreover, a yellow crown.

THE RED, OR PATAS MONKEY.†

The delicate red ground-colour of this Monkey readily distinguishes it from its more favoured allies. One in the Zoological Gardens is wonderfully human in the expression of its face and beautiful sad-looking large eyes. Its pale lips, eyelids, and cheeks, and the broadish pale forehead, with a slightly ridged nose, add to its appearance of suffering. It has a moustache, a few hairs on its nose, and whiskers, which are very cleanly kept in the proper whisker-line. The hair of the forehead forms a counter-curve, whose peak is just in the centre. Altogether it is a very pretty animal.

Bruce, the African traveller, when in Western Africa, took that trouble which is very rarely done by distinguished travellers in Africa, and observed Monkeys in a state of nature—the Red Monkey in particular. It is strange, considering the omnipresence of the Monkey element, that one may look over volume after volume of African travels, and very rarely meet with a note or word about them; but such is the case. So our obligation to Bruce is great. He says they descended in troops from the tops of the trees to the extremities of the branches, earnestly noticing, and apparently much amused by, the boats, as they passed along the river. They then began to take courage, and pelt the passengers with pieces of wood, thus provoking a most unequal combat. When fired upon, they uttered the most frightful cries, and although many fell, the survivors seemed by no means willing to relinquish the contest; on the contrary, they redoubled their efforts. Some flung stones at their adversaries, while others collected something very nasty as a missile; all, in short, displayed a determination of spirit which must at all times render them formidable to opponents of weaker powers than themselves.

* *Cercopithecus erythrogaster.* † *Cercopithecus ruber.*

The last group of the Guenons are often called the Mangabeys, from a mistaken notion that they come from Madagascar. But there are no Monkeys in that great island, whose forests are peopled by Lemurs instead.

RED-BELLIED MONKEY. (From the *Proceedings of the Zoological Society.*)

THE MANGABEY, OR WHITE-EYELID MONKEY.*

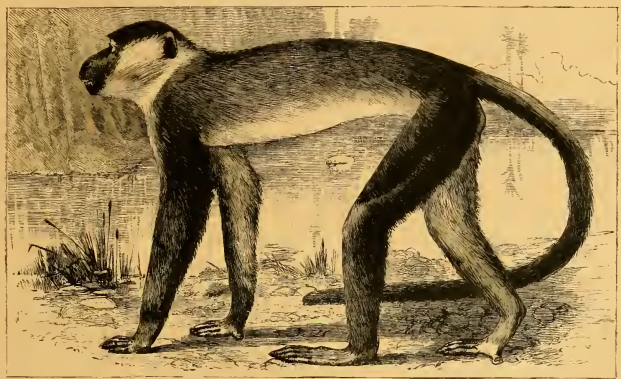
The general colour of this Monkey is a reddish-brown, which becomes decidedly red on the top of the head. There is a white band between the eyes, which is continued to each side of the back of the neck. A second kind has grey slaty-brown tints, without the white spot.

One thing strikes the observer at once, and that is the very affected way in which the Monkey sits, with its eyelids half closed; and as the upper ones are dead-white, they look almost like doll's eyelids, and as if they did not belong to it.

They are extremely restless, and are fond of placing themselves in curious attitudes, and so full of antics are they that it has been erroneously imagined that they really have more joints and

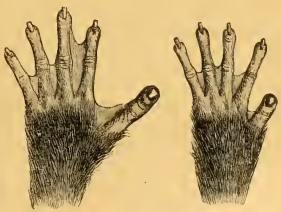
* *Cercopithecus athiops.*

muscles than the most agile of their allies. They are fond of carrying their tails reversed, so as to be on a line parallel with the top of the back, and their common expression of disgust is to show their teeth by raising the upper lip. It is always droll, frolicsome, and good-natured. Sir William Jardine



MANGABEY.

mentions a female in Mr. Wombwell's Menagerie that was most lively, and Broderip says:—"She performed many of the attitudes of the most experienced harlequins, and was remarkably cleanly and careful not to soil her person. When feeding, she seldom put her head to the food or dish, but lifted and conveyed it to her mouth. She was very fond of bread, milk, and vegetables, and of carrots especially." He gives a figure of her—no easy task, for she was never at rest for one moment, and her celerity was increased when she perceived she was noticed.



FOOT AND HAND OF THE MANGABEY.

The Mangabeys are all African, and are peculiarised by having a fifth cusp, or point, to the last crushing tooth on each side of the lower jaw, as in Semnopithecus. Now, they have no other resemblance to Semnopithecus, and all their structural peculiarities are those of the Guenons. They have, however, the web between the fingers carried as far forward as the first joint, and the hair comes close to the knuckles and the beginning of the short thumb. In the foot the toe-thumb is large, and, as usual, widely separate from the toes, the second and third of which are united by a web, which reaches almost to the last joint near the tips, and the third, fourth, and fifth are united by smaller webs. Evidently the peculiar crushing teeth of the Mangabey are a relic of an ancestral character, and we must look in some lower tribes for a corresponding arrangement, and in this we are assisted by the nature of the face, for the muzzle is rather projecting. In fact, they somewhat resemble the Macaques, or Inui, which will be considered next.

It is extremely interesting to find in Africa, and in the same parts of it, Monkeys living in the same forests, on the same kind of food, and exposed to the same climate and dangers, differing so

wonderfully in their colour and disposition. The difference has been caused by something more than adaptation to ends. Again, it is curious to note the different arrangements of the dental structure in the group amongst animals eating the same food and stowing it away in pouches.*

CHAPTER VII.

THE DOG-SHAPED MONKEYS (*continued*). THE MACAQUES.†

Their Description and Anatomy, and its reference to that of the Semnopitheci and Guenons—THE COMMON MACAQUE—Its Character—Appropriateness of the Name—Occasionally an Albino—THE ROUND-FACED MACAQUE—Found in China—Ideas of the Chinese about them—THE TOQUE, OR BONNET MONKEY—THE BRUNDER—Described by Cuvier—Their Thieving Propensities—Hindoo Tales of their Sagacity—THE MOOR MONKEY—BELANGER'S MONKEY—THE PIG-TAILED MACAQUE—THE MAGOT—One of the Commonest Monkeys—Described by Galen—Early Notices of—Predatory Habits—Abundant at Gibraltar—Probably came over from Africa—Similarity to the Baboons—THE WANDEROO—Account of one in the Zoological Society's Collection—Geographical range of the Macaques.

THE next group of Monkeys differs much from the lively dwellers amongst the woods and trees, which have been described, and the kinds contained in it are evidently suited for running quickly on all-fours, and more on the ground than amongst the branches. They are not so much like the Dog in shape as are the Baboons, which will be described next, but still they are, as it were, between these and the Guenons in their habits and construction. They have longer muzzles than the Guenons, but not so long as the Baboons, and the nostrils open high up and obliquely. Their eyes are overshadowed by a prominent brow-ridge, which gives an air of cunning not seen in the playful Guenons, and also a look of fierceness and of mistrust; and, in fact, the old ones look anything but amiable. Their limbs are stout and compactly made, and they display great strength and width in the shoulders. The hind limbs are, however, longer than the front ones, and the hands and feet are well made, the latter being long and having a large heel. But what strikes the observer, when he sees drawings or stuffed specimens of the whole group before him, is the difference in the length of the tail in different species. Some have long tails, others have very small ones, and one in particular has not one at all. Those with tails used to be placed in one genus, and those without them in another; and the first were called Macaques (*Macacus*), the others being Inui‡ (*Inuus*). But the close agreement of the other parts of the body, notwithstanding the length or absence of the tail, coupled with the fact that it is not used in climbing or in balancing, determined naturalists to rely but little upon that member in this group, and to join those with tails and without tails in one genus, called *Macacus*.

Those with long tails, the *Macacus cynomolgus*, for instance, cause the group to resemble the Guenons; or, in other words, link and ally the two genera, it being difficult in the case of this Monkey to say to which one it should belong. On the other hand, the Barbary Ape, which managed to get to Gibraltar and live there in some numbers, and which has but the very stump of a tail, connects the whole group, or genus, with the Baboons without tails. Then there is one with a fine head of hair, and a long snout (*Macacus Silenus*), which lives in Malabar, and which has a longish tufted tail; and it links some Baboons with long tails to the group now being described.

The Macaques live in India, Tibet, North and South China, Japan, and southwards, and in some of the great islands of the Archipelago, Formosa, in Africa, in Barbary, but not south of the Atlas range, and in Europe, on the Rock of Gibraltar.

They all have cheek-pouches and callous pads, or callosities, on their seat, and thus resemble the

* In the Cercopitheci the skull has a large brain-case, and that part on which the brain and cerebellum rest is concave or pitted on the petrosal bone, and on each side of the crista galli in the fore part of the skull. In general there is a laryngeal pouch. The first premolar is like that of the Semnopitheci. The other anatomical peculiarities of these and of the Semnopitheci will be found in the description of the Macaques and Baboons.

† *Macacus*, or *Inuus*.

‡ A name of the Roman divinity Faunus.

Guenons; moreover, most of them have throat or laryngeal sacs, which open into the membrane above the vocal organ and below the base of the tongue (in the thyroid membrane).

On examining their jaws it will be noticed that there is the same number of teeth as in the other Monkeys already described, and that the upper eye or canine tooth on each side is very strong and long. Now, these teeth are not for killing or stopping living prey, although their possessors do not hesitate to snap up a good-sized Beetle, a small Lizard, or even a Frog, but they make, with the first false grinder of the lower jaw, a capital nut-opener. The canine, when the mouth is shut, fits just in front of this tooth, which is usually called the first pre-molar, and which is pressed back and made to slant in the jaw by the constant pressure and movements of the canine. The back of the canine is sharp, and comes in contact with the equally sharp edge of the slanted pre-molar below, so that when a nut comes between the two it is cut and crushed at the same time. The canine does not thus fit into a diastema, or vacant space, but is of great use to the animal. This arrangement is interesting, because it produces a distortion of the front back teeth of the lower jaw for a definite and useful purpose: it is noticed in some of the Guenons, and is particularly seen in mouths of the great Baboons, which will be noticed further on.

The other back teeth resemble somewhat those of the Guenons, but the last one of the lower jaw has five cusps, or prominences, on it.

All these Monkeys going very readily on all-fours have several interesting modifications of the structures observed in the climbing Monkeys, but of course their general construction is the same. They have not, however, the pouched stomachs of the Semnopithecus, and their nearest resemblance is to the African Guenons.

Like all the Monkeys which are lower in the animal scale than the great man-shaped Apes, the Macaques have narrow wrists, long finger bones, and a short and backwardly-placed thumb. There are nine bones in the wrist. The hip- and haunch-bones are long, and the first are hollowed out, and their direction refers to the method of progression on all-fours, and their general appearance is rather that noticed in the regular four-footed beast of prey, and they differ much in breadth relatively to those of man.

The length of the tail depends upon the number of the tail-pieces, or vertebræ, and upon their size. In the Gibraltar Ape there are only three of these caudal vertebræ, but in the Rhesus there are fifteen and sometimes eighteen in the tail, which measures nine inches, whilst in the Pig-tailed Innus there are seventeen. It appears that some of the long-tailed kinds have no more vertebræ than the others, but that the diminished length is due to their shortening. The long and middle-sized tailed kinds have chevron- or Y-shaped bones under the tail, and the nature of these has been explained already.

Living upon a great variety of food, and using their jaws with rapidity, these Monkeys are furnished with a curious modification of a muscle, which exists in man and the higher Apes. There is in these a muscle on each side of the throat, which draws the chin down, or, in other words, helps to open the mouth. It is called the two-bellied, or digastricus muscle, as it has two muscular masses—one attached to the lower jaw, and the other to the lump of bone behind the ear—and they are united by a thin tendon. This tendon is attached to the side of the bone at the base of the tongue, or os hyoides, and it passes through a loop of a muscle which passes from the ear-bone (*styloid process*) to the os hyoides. The muscle acts as follows:—When the mouth is to be opened after swallowing, the base of the tongue-bone is pulled down by a muscle which comes from the breast-bone to it, and then the front belly, or muscle of the digastricus, pulls from the base of the tongue against the lower jaw and drags it open. But when the muscle relaxes, and the jaw is shut preparatory to swallowing, the digastricus begins to assist in this operation. In swallowing, the base of the tongue is drawn upwards towards the roof of the mouth, and the back and front bellies of the muscle now under consideration drag on their fixed tendon, and straighten, so as to assist in this.

In the Macaques, this tendon is replaced by muscular bands, and greater vigour is given to the muscle, so that the jaw is pulled at more rapidly, and the tongue is elevated with energy.

As there is a greater power given in drawing up the tongue in the first stage of swallowing, there must be something extra to pull it down again in the second stage, for in this the back of the throat, the gullet, and the back of the tongue are all brought from above to a lower level. This is arranged

by a modification of a muscle, which in man and the Chimpanzee, for instance, stretches from the top of the bladebone, across the lower part of the neck, to the bone at the base of the tongue (the *omo-hyoid* muscle). It has also two bellies in man, or, in other words, the muscular fibres are attached to the bladebone and to the hyoid bone, and there is an intermediate tendon; moreover, this passes through a pulley, so that the obliquely-placed muscle in the lower part of the neck acts straight upon the tongue, and pulls it down in a right line. In the Macaques, this muscle has no central tendon, and the muscular fibres pass all the distance from the bladebone to the os hyoides at the base of the tongue.

In addition to these modifications where muscle replaces tendon, there are those of several other muscles which act on the tongue, the larynx, and on the upper and lower parts of the windpipe, their

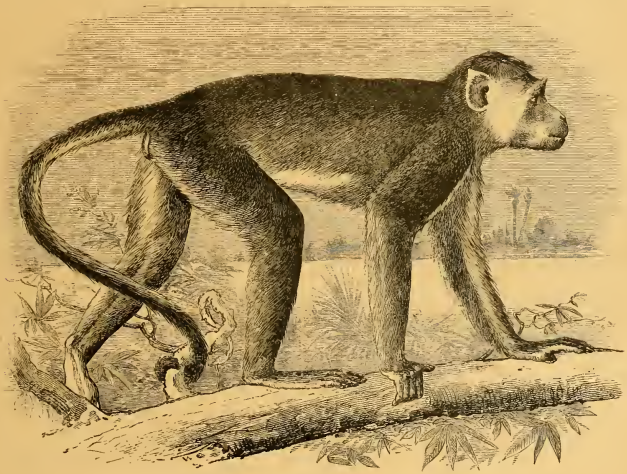
COMMON MACAQUE.

conjoined action being to approximate all these parts. These muscles, which are separate in man, are united in one in the Macaques.

The head of these Monkeys, hanging as it does when they go on all-fours, requires extra support, and one of the muscles of the back, which from its square shape is called the rhomb-shaped muscle, is especially attached to the occiput, and helps to hold the head up. Another assistant in the movement on all-fours is a muscle which pulls the bladebone forwards when the animal is walking. It springs from the outer processes of the upper bones of the neck (transverse process of the upper cervical vertebræ), and is attached to the spine of the bladebone. This muscle is seen in the great beasts of prey also, and in the Semnopitheci and Guenons. A similar "wild-beast" peculiarity exists in the arrangement of the muscles of the hand; the muscle which extends the little finger and opens it is divided, and has greater connections with the fourth finger than in man. The long muscle which extends the thumb, and the short one which draws it from the fingers, are not separate in the Macaques, but the muscle has two tendons, and thus foreshadows the arrangement which in man and the higher Apes gives such perfection of movement to the thumb.

The Macaques have their ears rather pointed at the tip, and not rounded, and the general shape of their bodies is not lanky like that of the active long-legged Guenons and Semnopitheci. They are less gracefully made, and the dog-like appearance, so palpable in the Baboon, is recognised in their fore parts and head. Moreover, the colours are not usually pretty and variegated, as in many of the kinds of the genera already described, but are dun and sad in tint. Their tail varies according to the species in length, and a rough method of classification may be made which divides them into those with long, those with moderate, and those with short and almost no tails.

The large Common Macaque (*M. cynomolgus*), and the Round-faced, or Formosan Monkeys (*M. cyclopis*), and the Bonnet Monkey, represent the long-tailed kinds; the Bhunder (*M. rhesus*), has a tail of middle length; and the short-tailed group about to be mentioned consists of the Moor,



TOQUE.

the Pig-tailed, and the Belanger Monkey. The tail-less one includes the Magot. Finally, the Silenus Ape, usually miscalled Wanderoo, is so baboonish that, although it has a long tail, it cannot be placed with the Common Macaque in the beginning of the chapter, but must come at the end, so as to lead to the true Dog-headed Apes, or Baboons, which will be described further on.

If the remarks in page 106 about the fourth division of the Cercopitheci are now read carefully, it will be understood how these Monkeys, the Macaques and the Baboons, form a group of creatures which is only really separable into kinds or species, but that the genera are very artificial.

THE COMMON MACAQUE.*

The so-called Common Macaque, or *Macacus cynomolgus*, represents the long-tailed section of the genus, and grows to be a powerful animal amongst the other small Monkeys, over a very wide extent of country. It lives in Java, Sumatra, Borneo, Celebes, Batchian, in the islands from Lombok to

* *Macacus cynomolgus.*

Timor, and in the Philippines. It is a quiet and tolerably amiable Monkey when young, but with years, it becomes a wild, savage, and very brutal creature. Even in menageries it is often nasty in its habits, and savage. So bad a character has it, that when the proper name to give it came under the criticism of Fred. Cuvier, he sought out those of all the wickedest and naughtiest men in Lempriere's Classical Dictionary, and finally considering that *Irus*, who disturbed the domestic peace of the sublimely virtuous, industrious, and persevering Penelope, was the worst of the worst, he fixed his name to that of this Monkey. But Buffon had, not from his bad qualities, or from any resemblance to the Monkey in disposition, his name attached to it long before; so it was called Buffon's Monkey, as well as the Hare-lipped, although one fails to recognise this condition in its face. To complicate matters, an English zoologist, who knew little of Penelope's feelings or trials, mistook the word Irus, and wrote it Iris! The word Cynomolgus may be translated "a pilfering or a lewd dog," so that it and Irus are very appropriate.

The huge shoulders of the full-grown adult strike one, and its general clumsiness also. There is a large body, and the limbs are short for it, although the tail is long. The fur is rather short, and is of an olive-brown, spotted with black on the head and body, but it is grey on the limbs, and blackish on the tail. There is no "hare-lip" in this Monkey, but there is no hollow going from the nose to the upper lip as in man, and only a raised line.

This Monkey is sometimes found perfectly white, with red eyes, or as an albino; its skin is then of a pinkish colour, and the long tail looks very curious, as there is not much hair on it. A male and female of this kind are very interesting in the Zoological Gardens; they dislike the glare of day, and are very lively and full of fun and malice. The female has the whiskers and all the beauty of hair, and the male is a quieter animal, but a great grimace-maker. He tries to look fierce when the sun is on his face, and looks most odd. He draws back his ears, so that they cling to the back of his head, and wobbles his eyes about in a most laughable manner. The female does not like to be disturbed in her nap after breakfast, and comes out to see what is the matter. If anything noisy is going by, she scolds violently, and if she can catch hold of her drinking-tin, she will bang it about in a very amusing manner. Sitting in her wooden house, she bangs the outside with the tin, and then dropping it, rushes out and fixes her teeth on the wooden branches in the cage. The deficiency of colouring matter in the iris of the eye allows so much light to enter that organ, that there is the same scowling or shading eye look in them as there is in human albinos.

The second example of a long-tailed genus is

THE ROUND-FACED MACAQUE,* THE FORMOSAN MONKEY.

These are very interesting Monkeys, with a human-like expression, which suffer considerably at the hands of the Chinese, for should one be captured, its tail is immediately cut off, the Chinese having a fanciful idea that the tail of the Monkey is a caricature of the Tartar pendant into which they twist their long back hair. They therefore cut off the tail of every Macaque that comes into their possession.

They live in Formosa about the declivities and caverns which overhang the sea, miles away from any woods. It seems to be quite a rock-loving animal, seeking the shelter of the caves during the greater part of the day, and assembling in parties in the twilight and feeding on berries, the tender shoots of plants and grasshoppers, &c. In the summer it collects in bands during the night, and commits depredations among the fields of sugar-cane and fruit-trees. They nurse their solitary young ones up in the hills, and betray much uneasiness—no wonder—at the approach of man. They seem, however, to possess abundance of self conceit.

The Chinese have some very curious notions about them, and about some other Monkeys which are either identical or are found with them. They say that in the Yaoukwang hills are animals whose exterior appearance is like a Mehow with human face and Hogs' bristles. During the summer they dwell in caves. They are called Hwatso, their cry is like cut water (noise of a mill), and when seen they are "ominous of a conscription" (*i.e.*, of being forced to work). The Yew are like the Mehow and of a deep black colour; their tails are long like the others, but have no tufts. When

* *Macacus cyclopis.*

they scent the dew ascending to form rain, they then suspend themselves by means of their tails to fill their nostrils with it, or else by both feet. The Gaou are said to inhabit the Lunseen hills, to be like an Ape with long arms, and to be good for killing. When their arms are cut through at the thick part, they can be made into flutes rounder than reeds. They are of the Monkey tribe, having long legs, and are good whistlers, and given to drag things about. The Yew are like the common Monkey, with green body and dark paws; they have black whiskers and black paws. They are naturally very fond of their whiskers, and doat on their species, living and dying together; on which account, if one can be got at, a hundred will be killed. Men shoot them with poisoned arrows; the shot animal's companions draw out the arrow in order to wound themselves and die with one another.

These round-faced Monkeys have, of course, callosities on the buttocks, and these at certain times become gorged with blood, so as to swell out and become greatly distended, being horrible to look at.

They resemble the common Rhesus Monkey, about to be described, in many points, and indeed the skulls present so many things in common that no satisfactory distinction can be made; but the bones of the pelvis, which are much curved, and the shorter limb-bones of the round-faced species, are distinctive.

The fur of this Monkey is thick and woolly, and is very slate-coloured. The tail is about a foot in length, is hairy, and has a black line along the top. The head is round, the ears are small and feathered, and the face is flat. The forehead is naked and the cheeks are dark-whiskered, and there is a strong ruffle-like beard.

THE BONNET MONKEY.*

This is a very common Monkey in menageries and zoological gardens, and is always an object of attention, as it is amusing, very active, full of tricks and malice, and a great stower away of nuts in its cheek-pouches. It is known amongst the other Macaques by its cap of long hair radiating from the crown, on which it rests flat, but it is often parted down the middle. It has a long tail, rather a long muzzle, and prominent ridges over the eyes, and the forehead is flat. Its fur is olive-grey, and sometimes greenish or brown in tint, whilst the under surface is ashy-white. It has large and often flesh-coloured ears.

The young often have their head of hair parted down the middle, and, as their face and forehead are pale and not hairy, they have a very human appearance.

Very good-tempered when pleased, this Macaque enjoys a bit of mischief, and if it can steal anything from a visitor it is intensely delighted. But when food is offered and then not given, the Bonnet Monkey shows that it considers itself wronged, and scolds and screams in a great rage. It has much capacity for accepting and stowing away food, and there are often fierce fights if one intrudes upon the store of another. Very fond of hugging and nursing others, it is equally delighted in searching the bodies of its companions for insect life; but, although thus amiable, it resents unkindness very decidedly and at once.

Another common Macaque is called the Toque, but it only differs from the Bonnet in the parting of its hair.

THE BHUNDER, OR RHESUS MONKEY.†

This is a Monkey with a medium-sized tail, which is well known to those Europeans who have lived in out-of-the-way places in British India.

It is a strong-looking creature when full grown, and has powerful shoulders and limbs; the tail is about one-third of the length of the body, which often attains the length of from one foot and a-half to two feet. The prevailing colour of the hair is olive-green and brown on the back, and the naked face is of a pale flesh-colour. There is no ruff of hair around the neck, and the ears are very visible, and there is a singular looseness or folding of the skin of the throat and belly. The callosities are often very red, and the insides of the legs also.

F. Cuvier observed the early days of one born in France, and noticed that immediately after birth it clung fast to its mother's stomach, holding on with its fore hands stuck in her fur, and that it did not quit the breast, even during its sleep, for fifteen days. In the first day of its existence it appeared to distinguish things, and to look at them carefully, and the mother was devoted to it, giving it the

* *Macacus radiatus.* † *Macacus rhesus.*

tenderest attention of a constant and patient nurse. Not a movement or noise on its part escaped her, and her maternal solicitude was quite astonishing. The weight of the little thing did not interfere with her moving about, and all her exertions were managed with a view of not incommoding her young charge. She never shook it, or struck it accidentally against the edges and corners of her house. At the end of a fortnight the little one began to detach itself, and from the beginning of its moving by itself it showed a great amount of vigour, power, and ability to run and jump, which human children of a year or two might well envy. It held on to the wires of its cage and crawled up and down at

BHUNDER AND BONNET MONKEY.

will, but the careful mother never took her eyes off it, and followed it wherever it went, and even held out her hands to prevent it tumbling when it became too venturesome. Indeed, she admonished the little one by a gentle touch that it had been away long enough, and must come in. At other times it walked on all-fours over the straw, and often let itself drop down from the top of its cage on to the soft bottom, so as to accustom itself to fall on all-fours; then it would jump up the net-work and lay hold and scramble with great precision. After a while, the mother began to teach the young one not to be so troublesome to her, and to manage without her, but still she took care of it, following it if it was doing anything out of the way and in danger. With strength the agility of the creature increased, and its jumps and bounds were wonderful, and it never miscalculated its distance, or made a false step. After six weeks a more substantial nourishment than milk was required, and then a very curious

spectacle was seen. This attentive mother would not let the little one have a bit of all the nice things, but drove it away and scolded it, although it was hungry. The old one took possession of the fruit and bread which were for both, and boxed the little one's ears if it came close and hid up the food. She had hardly any more milk, and the young one was in daily want of food, but the old one did not appear to act from cruelty or gluttony, but wished to train up the youth, like the young Cyrus, to feats of daring and of skill. As hunger pressed, the young one became bold, and stole by art what he could not get otherwise. If he was very adroit, all the better, and he was commended by being allowed to carry off his own. He used to get to the further end of the cage, and turning his back on his mother would begin to gormandise. But even the maternal solicitude was not wanting, for she

MOOR MACAQUE.

often used to go up to him and snatch a nice titbit out of his jaws. Perhaps this was a mistaken idea, for after a while a larger quantity of food was placed in the cage, and the little one had its quantity without any stealing.

The Bhunders are sacred in some parts of India, and are left very much to themselves; so they assemble in troops, and steal from among the natives in a very troublesome manner.

As they are very bold, their habits in the wild state are often observable, their slyness and thieving propensities being most amusing. They gather on the roofs of the low houses in the bazaars, and look out for occasion to steal. One was observed on a roof fronting a sweetmeat shop, and feigning to be asleep; but every now and then he looked wistfully at the luscious prizes below. It was, however, of no use, for sitting beside his stores was the seller, smoking his pipe, and looking decidedly wide awake. This went on for half an hour, when the Monkey got up, yawned, and stretched himself artfully, as if he had only just awoke. He began to play with his tail, and even made believe he was tying knots in it, as if he were wholly intent on it; but ever and anon he gave a sharp, sly look over his shoulder at the sweetmeats, but only to see the seller still there

smoking away to his heart's content, and ruminating concerning prospective customers and profits. The Monkey still had patience, and amused himself with his fleas, and had a good and general scratch; and he was rewarded, for suddenly the confectioner arose from his seat, took his pipe, and turned towards the back door for a fresh supply of tobacco. Instantly the Blunder was on all-fours, and the sweetmeats were before him and behind their owner. In another moment he had jumped off the roof, cleared the street, and was on the board which was crowded with sugar-plums. He of course began to cram as many as possible into his cheek-pouches. But, alas for the spoiler, there were other pilferers there in the shape of hornets; his sudden descent frightened them, and they flew off, but returned on the instant, and to take vengeance. Before he could regain his roof they were all round him, stinging here and stinging there with great zeal and passion. His efforts at getting away from them were frantic, and he scrambled over the rotten roof, displacing the tiles, which came down with a crash; and at last, when he jumped clear of the enraged insects, he came on to a sharp, thorny bush, from which he could not extricate himself. He had to spit all the nice things out of his pouches, and, screaming with pain—for the thorns were more like fish-hooks than anything else—he sat a picture of misery, barking hoarsely now and then. The fall of the tiles brought out a crowd of natives, and they were speedily joined by the confectioner, full of revenge. But the culprit was a Monkey, and, therefore, an object of veneration; so a couple of Hindoos managed to rescue him, and he limped off as well as he could to a neighbouring grove.

The Hindoos tell many tales of the sagacity of this Monkey; and there is one which may be taken as a specimen, although it has been filtered through Mahomedan pages. A fakir had a Monkey which he had brought up from birth. He loved it, and travelled here and there, taking much care of it. In return the Monkey behaved like a watch-dog, and was most faithful and watchful. It amused the fakir by its endless tricks and mimicry. One day, the fakir placed his carpet in a square before the palace of some great shah who had nothing to do, and who looked at the fakir and the Monkey with great delight. The fakir had made a pie; there were some pieces of birds' flesh in it, and it was placed on some lighted charcoal to be cooked. The Monkey sat watching, and the fakir thought he would like a stroll until dinner was ready, knowing that his faithful follower would look after the cooking. But the shah saw more than the fakir; for, after a while, the smell of the meat came strongly into the Monkey's nostrils, and he began to feel hungry. Soon he was very hungry, and then he just lifted up the edge of the crust, and could not refrain from taking a tiny bit—just a little leg. This was so nice that he took a little more, and finally eat all. The crust was left on the grass, and then the sinner suddenly remembered his master. The shah was in ecstasies, wondering what would come next. After due consideration, the Monkey remembered that he usually sat on a very beautiful flesh-coloured "callosity," and he had noticed that several Crows and other birds had been hovering about whilst he consumed his master's dinner. He instantly feigned to be dead, and hiding his head, gave the birds the benefit of the scarlet appearance. One came down instantly with a swoop; but the Monkey was too quick, and the bird was seized and strangled in an instant. Rapidly plucking off the feathers, the Monkey pulled it to pieces, and put it in the pie, and sat looking happy, contented, and extremely virtuous. The shah was struck with this wonderful display of instinct, and the story goes on to say that he promoted the fakir to an important post under government.

There is a Macaque which, instead of having the quiet brown and olive tints of the others, with short tails, is of a dark oily black colour. It is called

THE MOOR MONKEY.*

It lives in Borneo, and is about eighteen inches in length. It has a flat nose, with nostrils opening well outwards, and the eyes are hazel, the pupils being very large. The length of the bones of the tail is not enough to carry it beyond the callosities, which are of a roseate hue.

When young the skull is short, and there is no great projection over the eye; but with age the upper part of the face becomes very square, and the eyebrow ridges grow. Now, this gloomy-looking Monkey offers some points of interest, for there is another one, called the Booted Monkey (*Macacus ocreatus*), which cannot be distinguished from it when both are young. With age, however, the last-

* *Macacus maurus.*

named one becomes oily black, has a longer tail, and the hair on the head has a bushier appearance. But can these distinctions be accepted as showing a difference in the species? Probably not; and it will be for the student to consider that Monkeys may have races and varieties which really pertain but to one species, and yet are separated by the naturalist.

There are other short-tailed species of the Macaques, of which one, called the Handsome Monkey (*Macacus speciosus*), has a red face. It is from Japan, and is educated by the showmen there to do tricks like the Rhesus Monkey of India.

Another kind is interesting, because it gives a hint how a tail may be gradually lost from being in the way.

BELANGER'S MONKEY.*

This is found in Cochin-China, Singapore, Burmah, and up in the hills of Upper Burmah, Cochin, and Assam.

Its tail is more than a stump, yet is not half a middle-sized one, as it does not come lower than the haunch-bones. The Monkey is much troubled with it. Sometimes it is stuck up erect, but usually it is curled inwards, as if the animal were ashamed of it, and had done something wrong. When this is the case, the end quarter of it is doubled up, and thus the space between the haunch-bones is filled, as it were. The animal then sits on its tail and on its callosities, which are on the haunch-bones, and the consequence is that the surface of the tail, thus compressed, becomes hard and callous. Here, writes Dr. Anderson, the Indian zoologist, is an instance of a Monkey sitting on its tail; and the habit appears to be peculiar to the species. The tail is very degenerated, so far as its bones are concerned, and the curvature of it appears to be caused by the animal desiring to curve it out of the way of pressure. Perhaps, according to Lord Monboddo, this is the first symptom of the loss of tail. With regard to the other peculiarities of this species, it may be mentioned that it has pretty eyes, and is exceedingly easily domesticated.

THE PIG-TAILED MACAQUE.†—THE BRUH.

This is a short, thin-tailed kind, comes from Sumatra, Borneo, and the Malay Peninsula, and is called by the natives the Bruh—climber of the palms. It is said to be used by the natives to collect cocoa-nuts, and is domesticated by them, being often found in their houses.

THE MAGOT.‡ THE BARBARY APE. THE TAIL-LESS APE.

This is a very celebrated kind, and it has made its mark in the history of science and of the world. It was dissected by Galen; it took part in the great siege of Gibraltar, and is one of the most popular of the companions of the organ-grinder. Moreover, as will be noticed further on, it is an animal which may be classified with the *Cynocephali*, or true Baboons, to be described in the next chapter, without doing much violence to science.

It is called Magot by the French, and it is the Pithecus of that great old physician, Galen, who, when he could not learn anatomy by dissecting the human body, which was not allowed, investigated that of the Tail-less Ape. Born at Pergamo, about the year A.D. 131, Galen studied literature and then anatomy when young; and visiting Alexandria, was greatly delighted with being permitted to examine a human skeleton there, and subsequently to dissect a robber, who had remained without burial. Seeing that anatomy and physiology were the very foundations of medical practice, and noticing the resemblances of man and the Ape, he set to work and wrote largely on anatomy, but made the Ape his model. He was far before his age, and, therefore, abominable in the eyes of the antiquated practitioners; so his career as a physician in Rome was short. Nevertheless, his voluminous works lasted longer than his critics, and influenced the rise of medical science and the comfort and lives of mankind for many centuries. His anatomy was wrong, because it was that of the Ape and not of man; but, nevertheless, so strongly were the medical anatomists—who never dissected but only read—impressed with the correctness of his so-called human anatomy, that when Vesalius did dissect men and describe them,

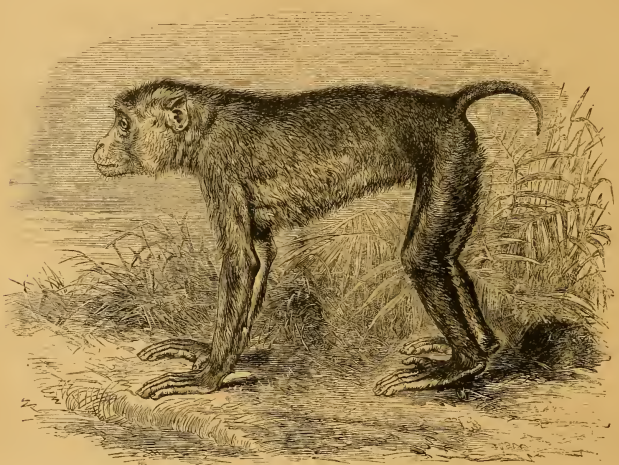
* *Macacus brunneus.* † *Macacus nemestrinus.* ‡ *Macacus sylvanus, or Inuus ecaudatus.*

he was pooh-poohed by the faculty as of no authority whatever. Just as Oxford opposed the learning of Greek, so the first physician of Henry IV. of France decided against human anatomy and Vesalius; but Greek and Vesalius triumphed after a while.

Nevertheless, humanity for many centuries was under a deep obligation to the Magot, inasmuch as surgery, as applied to man, was founded upon observations on the construction of the Ape.

Strabo knew that North Africa was peopled by the Tail-less Ape, or Pithecus; and he asserts that Posidonius, on going from Cadiz to Italy by sea, stopped in Lybia (the present Barbary), and saw large numbers of these Apes in the forests, which came down close to the water side.

The Magot is about the size of a middle-sized Dog, and measures from two to two and a half feet

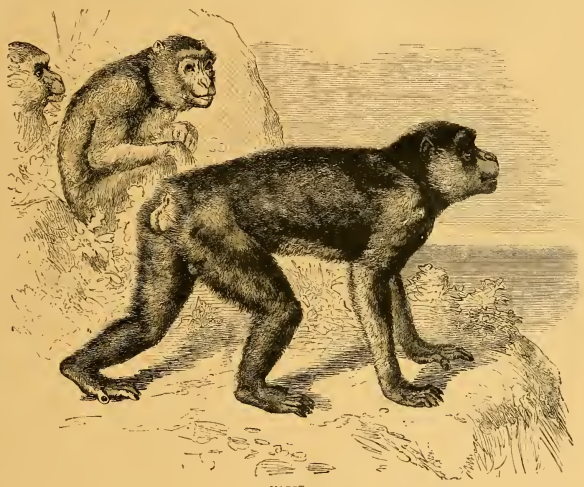


PIG-TAILED MACAQUE.

in length. The upper parts of the body and outsides of the limbs are of a light yellowish-brown colour, which is deeper on the head and round the cheeks; the under parts are whitish; and the face, ears, and other naked and hairless parts are flesh-coloured. The bald face, rather pale in tint, is long and wrinkled, and it is this which gives an old look to them, even when they are young. It is a robust animal when full grown, and has then deeply-set eyes, which are rather close together, and a projecting brow. The erect posture can be maintained for a short time, but it is not natural to it; on the contrary, it moves on all-fours quickly, jumps and climbs with great agility, scampering over broken ground or getting into the trees equally well. It squats on its haunches, and often sleeps with the head hanging down over the chest. Always alert and full of mischief, they assemble in troops, especially on the flanks of the Atlas range, place their scouts on trees, like so many Crows, and despoil the fruit plantations and gardens. In this they resemble the Baboons, whose marauding expeditions will be noticed further on.

This is the Monkey which is tolerably common on the Rock of Gibraltar; and they were there before the sea wore away the land and formed the Strait. They are essentially Rock Apes, and like

trees near rocks, and, therefore, they are not found in desert tracts or in deep woods. Formerly the Rock of Gibraltar was no doubt continuous with the range of hills far over the sea to the south, and there the Magot plundered (or, rather, took what Nature let him take; for man had not then come to disturb him) the fruit of Kabylia, Algiers, and Morocco. People have invented many methods by which the Magots could come from Barbary on to the Rock of Gibraltar: some believe in a subterranean passage, which is said still to enable the occasional visits of African relations to their European kindred; and others, more practically inclined, believe that the Apes came over on board ship by stealth. Certain it is that the strong current through the Straits prevents anything from drifting from one side of them to the other. Some years since, some caves were opened and carefully examined in the Rock of Gibraltar, and bones were found of kinds of Hyænas, of Rhinoceros, and



MAGOT.

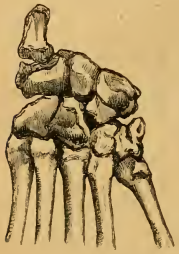
of Elephants, all comparable with those still living on the African Continent. Now, such animals could not at the present time live on the Rock, but they might have done so when it was part of a country extending right away to Africa. Their bones were washed into valleys amongst the hills, and then they fell into deep fissures and became preserved; and this could only have taken place when there was much water in the neighbourhood; and for there to be much water, the whole aspect of the country would have to be changed—to be extended far and wide where the sea now is.

No Monkey bones were found; but this is to be explained by noticing what occurs in India. There a dead Monkey is rarer than a dead Donkey in England—so rare, indeed, that the natives believe that their fellow Monkeys bury them; but the fact is there are plenty of beasts of prey ready to devour them, sick or dead, and therefore Monkey bones are very seldom found.

It is probable, then, that the Magot, and many African and some European animals, lived in the south of Spain when the Peninsula was united to North Africa. It has lasted longer than its great fellow-beasts, and still lingers there, but in greatly diminishing numbers.

What they live upon on the Rock is rather a mystery, for there are no groves of fruit-trees or

plantations to be robbed, but only roots and bulbs to be dug up. Perhaps it is this spare diet which restricts their numbers and causes them to be very watchful. It is notorious that they are rarely approached, but sometimes they are trapped, or seduced into mischief, which ends in captivity. All kinds of stories are told at Gibraltar, and by most of those who have resided there, of the acts and deeds of the Rock Monkeys. Once upon a time, a strong party of these Apes, headed by an old male, who had grown grey in audacity and mischief, were always stealing and ruining the belongings of a certain regiment in garrison, and at last the annoyance became so great that it was determined to catch the ringleader, if possible. The men caught him, and shaved his head and face, and then they let him go. Away he scampered to his party, who had been watching for him at a distance, eager, no doubt, to place himself at their head again and lead them to vengeance. He was received with a volley of sticks and stones by his own troops, who treated him so roughly that he had to fly for his life. In this deplorable and degraded state, he was fain to sneak back to his old enemies, the —th regiment, and presented himself at their quarters, so woe-begone and with such a rueful visage, "all shaven and shorn," that there was no resisting the appeal. Broderip says: "He was admitted, and remained with his new allies, whom he served with fidelity, upon the principle that secures the faith of other allies—because he couldn't help it." It is said in one of the stories of the great siege that the Monkeys saved Gibraltar as the Geese saved Rome, for the Spaniards attempted to surprise the place a few weeks before the regular siege commenced; but, fortunately for the British, the attacking party had to pass where a number of these Magots had collected. Both parties were startled at the noise, but the British were put on their guard, and the old fort was thoroughly ready for the enemy. General Elliot, afterwards Lord Heathfield, never suffered the Apes to be molested or taken; but one had been made prisoner previously to the time of his being made Governor of Gibraltar, and was kept chained in his yard. Another Monkey, who had apparently fallen from a rock, had been picked up by one of the General's aides-de-camp and conducted to the same place. Nothing could be more striking than the meeting of the pair. It was evidently the recognition of two old friends or relatives. After contemplating each other for a few seconds, they rushed into each other's arms, then pushed each other a little back, as if to make sure of the recognition, and, after a second mutual examination, again clasped each other to their breasts.



WRIST-BONES OF THE MAGOT.

The Magots, like all other Monkeys, are playful, affectionate, and gentle, when young, to those whom they know, but they become cross and vicious with age, and are generally greatly brutalised by their masters—in fact, brought to the same level.

The absence of a tail makes the Magot look very baboonish, and this appearance is not lost when the animal is dissected, and the skull is examined. This is much less animal-looking than that of any one of the Baboons, for it has not so much face, and the front of it is not so disfigured with ridges and swellings. But the forehead is "villainous low," and there are well-marked ridges over the orbits, the skull not rising behind them; and, as a matter of course, the brain case is flat, the brain itself being low in height. The palate is narrow and long, the face is flat, and the chin recedes. There is a capital set of teeth, and the last grinders of the lower jaw (third molars) have their fifth cusp, or tubercle, subdivided by two side-slits. In this, and in the tail, which is excessively rudimentary, and only has three bones, or vertebræ, the Magot departs from the usual form of the Macaques as a genus. The sutures of the face and skull—that is to say, the joinings between the bones—are soon obliterated in this animal; and it appears to have the nose (nasal) bones joined in one at an early age, thus resembling the Baboon and the carnivorous animals.

So many tricks are taught these clever Magots, and with such ease, that one would expect to find a fairly-developed brain; but an examination of one shows that it is hollowed beneath and narrow in front, whilst it is broad behind, and extending well back, and covering the cerebellum.

Their special muscular structures resemble those of the other Inui, and even their stump of a tail has the muscles which are common to those of all Monkeys, but which in this instance are useless.

It will be noticed in the engraving of the wrist-bones that one projects behind. This is the pea-shaped, or pisiform bone. It is small and at the side of the wrist in man, but here it acts like a front *heel* bone. The length of the three middle long bones of the palm, or metacarpals, is nearly equal; and this is an interesting point, as it prevents the third finger from being so much the longest, and gives the hand more or less a foot-like appearance.

THE WANDEROO.*

Wanderoo is the English way of spelling and pronouncing the word by which the native inhabitants of Ceylon call all Monkeys; and it is certainly misapplied in this instance, for the animal is not truly one of the Cingalese Monkeys, although it has been brought into the island. It lives in the neighbouring part of the south of the peninsula of Hindostan, especially in the country bordering the Malabar coast. It is a small animal, probably never reaching two feet in length, and the tail may be that of ten or twelve inches; but, from the stories which have been told and invented, one would conceive the Wanderoo to be a giant in wickedness as well as in physical power.

FACE OF THE WANDEROO.

They have slim bodies, which are covered with deep black hair, and there is a longish tail of the same colour, ended by a little tuft. Their head looks very large, because of a mane, or ruff, and beard which surrounds the face, sticking out in a wild kind of way. This mass of long hair is either grey or white in colour, and adds to the sly look of the broad face, soft dull eyes, and rather long black muzzle.

A former dignitary of the Roman Catholic Church, the Procurator-General of the Barefooted Carmelites, Father Vincent Maria, writes that there are four kinds of Monkeys on the coast of Malabar, and then proceeds to describe the Wanderoo. He says that this is perfectly black, is clothed with glossy hair, and has a white beard round his head and chin, measuring rather more than a palm in length. To him all the other Monkeys show such deep respect, that in his presence they are submissive, and humble themselves as if they were aware of his pre-eminence. The princes and great lords esteem him highly, for that he is, above every other, gifted with gravity, capacity, and a wise appearance. Easily is he taught to perform a variety of ceremonies and courtesies, and all these in so serious and perfect a style as to make it a great wonder that they should so exactly be enacted by an irrational animal. This excellent character does not appear to have been peculiar to all the Wanderoos; for some have been described as savage and disgusting in the extreme, and as most vicious and malignant in captivity. But it is probable that the gentleness of disposition which has been so noticed by those who have kept them kindly was spoiled by teasing and maltreatment.

The showmen call this Monkey the "Child of the Sun;" and Broderip suggests that it is the ruff, with the head peeping through, which gives a faint likeness to old Sol over a public-house door: and that probably the dark colour of the animal impressed his exhibitors with the great heat he enjoyed in his Indian home.

* *Macacus silenus.*

Certainly they like the sun; and we have often seen a pair at the Zoological Gardens sunning themselves after their breakfast with great delight. They sit on a bar, close to the wires of the cage, and climb four or five feet up it, clinging close to their iron prison, just in the range of a sunbeam. They spread out their black hands, and enjoy the glare, becoming sleepy and disinclined to pay any attention to nuts, cakes, and other temptations. They peer down at you with their expressive eyes, and give an occasional twist to their tail, to pull it close to them, probably after a long experience of the habits of the other Monkeys in the cage, who certainly have not an overwhelming respect for them. It is curious to see them climbing slowly, and without the great exertion and bounds of some of the Guenons, and to notice their marching, head and back downwards, whilst they crawl along the under-side of the roof of their house, looking down every now and then in a cunning sort of manner.

Broderip used to watch one, when the Zoological Society's collection was in its infancy in Bruton

WANDEROO.

Street, and a right merry fellow was he. "He would run up his pole and throw himself over the cross-bar, so as to swing backwards and forwards as he hung suspended by the chain which held the leathern strap that girt his loins. The expression of his countenance was peculiarly innocent; but he was sly—very sly—and not to be approached with impunity by those who valued their head-gear. He would sit demurely on his cross perch, pretending to look another way, or to examine a nut-shell for some remnant of kernel, till a proper victim came within his reach; when down the pole he rushed, and up he was again in the twinkling of an eye, leaving the bare-headed surprised one, minus his hat, at least, which he had the satisfaction of seeing undergoing a variety of transformations, under the plastic hands of the grinning monster, not at all calculated to improve a shape which the taste of a Moore [the hat maker of the day], perhaps, had designed and executed. It was whispered—*horrescimus referentes*—that he once scalped a bishop, who ventured too near, notwithstanding the caution given to his lordship by another dignitary of the Church, and that it was some time before he could be made to give up, with much grinning and chattering, the well-powdered wig which he had profanely transferred from that sacred poll to his own. The lords spiritual of the present day, with one or two exceptions, are safe from such sacrilege. Now it would be nearly as difficult to take a wig off a bishop as it once was to take the breeches off a Highlandman. But another Wanderoo, confined in the open part of the

gardens in the Regent's Park, was of a different temperament. There was a melancholy about this creature. He would climb his pole, ascend to his elevated house-top, and there sit for half an hour together, gazing wistfully at the distant portion of the park—which presented, when viewed from his position, the appearance of a thick wood—every now and then looking down, as if he was contrasting the smooth, sharp-pointed pole, to which they fettered him, with the rugged, living 'columns of the evergreen palaces' of his fathers." The Wanderoo often loses some of his tail in captivity; but it should be, when full-grown, terminated by a tuft, which, in the imagination of some, has been considered quite lion-like. Having large cheek-pouches, this Monkey, very un-lion-like in disposition, feeds rather rapidly, and stores away much for future occasion. In doing this it either carries the food to the mouth with the hand or places its mouth to the object. It moves on all-fours, and has callosities; and these, and the tail, give it a very baboon-like appearance. Nothing is known of their habits in their wild state.

The geographical range of the Inui, or Macaques, is very great, and some of the twenty-seven species of which the genus is composed have very restricted wandering grounds, whilst others are found over a wide extent of country. As a group, they are found from North Africa to China, and species are met with at Gibraltar and Eastern Tibet, and within range of the everlasting snow. They are found in the peninsulas of India, and in the great islands as far south-west as Timor and in the Philippines, but not in Celebes or in New Guinea.

CHAPTER VIII.

THE DOG-SHAPED MONKEYS *(continued)*. THE BABOONS.*

Early Accounts of the Baboon—Origin of the Name—Held as Sacred by the Egyptians—Used as the Emblem of Thoth—Brought into Europe in the Middle Ages—Their Literature—General Description of the Family—Structural Peculiarities—Brain—Skull—Geographical Distribution—THE SACRED BABOON—Found in great numbers in Abyssinia—Formidable Antagonists—Size and Colour of the Male and Female—Anecdotes—Propensity for Spirituous Liquors and Thieving—THE GELADA BABOON—THE PIG-TAILED BABOON—Usually called Chacma—Description of it—Its Ferocity in Captivity—Le Vaillant's Monkey—THE SPHINX BABOON—Its Dexterity of Aim—THE ANUBIS BABOON—Its Locality and Food—Method of Running—THE COMMON BABOON—Often Found in Captivity—Anecdotes—Anatomical Peculiarities.

JOHN LEO, an ancient traveller, who wrote about his perils and adventures in "his nine bookes," says, regarding his experience of Africa, that "of Apes there are divers and sundry kinds, those which have tayles being called in the African tongue *Maime*, and those which have none *Babuini*. They are found in the woods of Mauritania, and upon the mountains of Bugia and Constantia. They live upon grasse, and come and goe in great companies to feed in the cornfields; and one of their companie, which standeth centinelle or keepeth watch and ward upon the borders, when he espyeth the husbandmen comming he cryeth out, and giveth, as it were, an alarm to his fellows, who every one of them flee immediately into the next woods, and betake themselves to the trees. The shee Apes carry their whelpes upon their shoulders, and will leape with them in that sort from one tree to another."

This author, although he probably mixed up other Monkeys with his *Babuini*, gives the key to the derivation of the word baboon, which has been the subject of keen controversy amongst those who are curious in such matters. *Papio* is the common term applied to these animals by the writers of the fifteenth and sixteenth centuries; it is "dog latin" for *Babio*, which in modern language would be rendered *Papa*, and *Babuino* is the diminutive of *Babbo*. Doubtless these terms bear some important and hidden reference to the opinions of the African races upon their relationship and connection with the clever Apes, and upon their appreciation of the paternal habits of the patriarchs of the great

* *Cynocephalus*.

companies who not only stand "centinelle," but instil good discipline into the younger members of the family.

But long before John Leo lived, these *Babuini* had been noticed and critically observed by Greek and Roman naturalists, and had received, on account of their especial character—their dog-shaped muzzle and head—the name Cynocephali, or Dog-headed Apes. The word comes from the Greek, and was frequently applied to Dog-headed people as well as Apes, and it is very applicable, for the whole aspect of the head, and especially of the prolonged snout, cut short at the end in the Ape, greatly resembles that of some Dogs. Earlier still, the ancient Egyptians engraved its figure in stone, made metal images of it, drew it on papyrus, and even made mummies of their dead bodies. Hermopolis was especially the city devoted to the worship of the Dog-headed, for in those early days such was their grandeur in Egyptian eyes, and such the folly of mankind. Symbolism was carried to an excess, its foundations being as mysterious as meaningless, and it therefore came to pass that the Dog-headed were mixed up with literature and astronomy.

That admirable investigator and popular exponent of the sculptures and hieroglyphics of the ancient Egyptians, Sir Gardner Wilkinson, writes that "The Cynocephalus Ape, which was particularly sacred to Thoth, held a conspicuous place among the sacred animals of Egypt, being worshipped as the type of the god of letters, and of the moon, which was one of the characters of Thoth. It was even introduced into the sculptures as the god himself, with 'Thoth, Lord of Letters,' and other legends inscribed over it; and in astronomical subjects two Cynocephali are frequently represented standing in a boat before the sun, in an attitude of prayer, as emblems of the moon. Their presence in a similar boat with a Pig probably refers to them as types of the divinity, in whose honour that animal was sacrificed; the moon and Bacchus, according to Herodotus, being the sole deities to whom it was lawful to immolate Swine, and that only at the full moon. But the presence of Cynocephali was not confined to Thoth or the moon. On two sides of the pedestals of the obelisks of Luxor four Cynocephali stand in the same attitude, as if in adoration of the deity to whom those monuments were dedicated; a balustrade over the centre doorway of the temple of *Amun* at Medinet-Aboo is ornamented with the figures of these animals; and a row of them forms the cornice of the exterior of the great temple dedicated to *Ra* at Aboomubel. Sometimes a Cynocephalus placed on a throne as a god holds a sacred Ibis in its hand; and in the judgment-scenes of the dead it frequently occurs seated on the summit of the balance as the emblem of Thoth, who had an important office on that occasion, and registered the account of the actions of the deceased. The place where this animal was particularly sacred was Hermopolis, the city of Thoth. Thebes and the other towns also treated it with the respect due to the representative of the Egyptian Hermes, and in the necropolis of the capital of Upper Egypt, a particular spot was set apart as the cemetery of the sacred Apes. Mummies of the Cynocephalus were put up in a sitting posture, which is usually that given to the animals in the sculptures when representing the god Thoth; and its head forms one of the covers of the four sepulchral vases deposited in the tombs of the dead. It was then the type of the god *Hopi*, one of the four genii of *Amenti*, who was always figured with the head of a Cynocephalus. Many of this species of Ape were tamed and kept by the Egyptians, and the paintings show that they were even housed for useful purposes."

Elsewhere the same author informs us that "the Cynocephalus is synonymous with the hieroglyphic of letters; and we even find it holding the titles and fulfilling the office of Thoth, which shows that it was not only the emblem, but also the representative of the deity." "Thoth in one of his characters corresponded to the moon, and in the other to Mercury. In the former he was the beneficent property of that luminary, the regulator and supervisor of time, who presided over the fate of man and the events of his life; in the latter the god of letters and the patron of learning, and its way of communication between gods and men. It was through him that all mental gifts were imparted to man. He was, in short, a deification of the abstract idea of the intellect, or a personification of the intellect of the deity."

The judgment-scenes found in the tombs and on the papyri show that the good actions of the deceased are placed in a row on one side of the balance, and the figure or emblem of Truth on the other. Anubis, the director of the weight, proceeds to ascertain the claims for admission into the region of Amenti, and if on being weighed he is found wanting, he is rejected, and Osiris, the

judge of the dead, inclining his sceptre in token of condemnation, pronounces judgment upon him, and condemns his soul to return to earth, under the form of a Pig, or some other unclean animal. Placed in a boat, it is removed under the charge of two Monkeys, who open out to it a new term of life. The Monkeys drawn have tails, and are evidently Dog-headed.

Baboons were brought from Africa, and sold in all directions in Europe by the merchants of the Middle Ages, and it was thought to be out of the fashion not to have an Ape in one's establishment. They were dressed up, and sometimes admitted to feasts, and taught manly kinds of tricks and good behaviour. Broderip hunted up an odd story, which refers to an Ape in the sixteenth century, which did a vast deal of mischief very unintentionally. In the play of *Much Ado About Nothing*, as readers of Shakspere will doubtless remember, Benedick is said by the lively-spirited Beatrice to have stated that she got her wit out of the Hundred Merry Tales—"And that I had my good wit out of the 'Hundred Merry Tales.'" What this book was could hardly be decided; some thought that it was Boccaccio's "Decamerone," but they appear to have been printed by John Restell, the title being, "A C. Mery Talys." The wit is well enough in these "tayles" to make Benedick wince under Beatrice's imputation. One story is headed, "Of the Welcheman that delyvered the letter to the Ape." The first lines are wanting, but there is enough to make it appear that a master sends his Welsh retainer with a letter to the chief justice, in order to obtain a favour for a criminal who had been in the writer's service, with directions to the said Welshman to return with an answer. "This Welcheman came to the chefe justyce place, and at the gate saw an Ape syttynge there in a cote made for hym, as they use to apparell Apes for disporte. This Welcheman dyd of his cappe, and made cortsye to the Ape, and said, 'My master recommendeth him to the lord your father, and sendyth him here a letter.' This Ape toke this letter and opened it, and lokyd upon the man, makynge many mockes and noyes as the propertyes of Apes is to do. This Welcheman because he understood him not, came agayne to his master, accordynge to his commandes, and told hym he delyvered the letter unto the lorde chief justice sonne, who was at the gate in a furred cote. Anone hys master asked him what answer he brought. The man sayd he gave him an answer, but it was French or Laten, for he understode him not. 'But syr,' quote he, 'ye nede not to fere, for I saw in his countenance so muche that I warrant you he wyll do your errand to my lorde his father.' This gentleman in truste thereof made not any further suite, for lacke thereof his servaunt that had done the felonye within a month after was rayned at the kinge's benche and corte, and afterwards hanged." In the punishment for matricide the criminal was placed in a case with an Ape, Cock, and Serpent, and either buried alive or drowned; and the dislike of the first two creatures was much enlarged upon in some ancient authors.

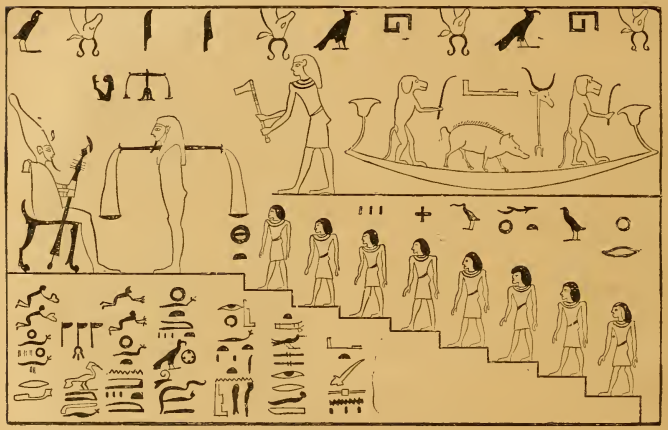
CYNOCEPHALUS. (*Egyptian Monuments.*)

In the *Merchant of Venice* there is allusion made to the fanciful notion of Monkey—and probably it was Ape—keeping. Shylock has lost his daughter, and Tubal comes to give him news of her fast living, and of Antonio.

Tubal. One of them showed me a ring, that he had of your daughter for a Monkey.

Shylock. Out upon her! Thou torturest me, Tubal: it was my turquoise; I had it of Leah, when I was a bachelor: I would not have given it for a wilderness of Monkeys.

In a "New History of Ethiopia, being a full and accurate description of the Kingdom of



JUDGMENT-SCENE FROM AN EGYPTIAN MONUMENT.

Abyssinia, vulgarly" (writes Broderip), "though erroneously, called the Empire of Prester John, by the learned Job Ludolphus" (1682), there is a grand engraving of Apes, with this superscription:—

"1. Scrambling about the mountains.
2. Removeing great huge stones to come at the wormes.
3. Sitting upon Ant-hills and devouring the little creatures.
4. Throwing sand or dust in the eyes of wild beastes that came to sett upon them."

The following is illustrated by the above:—

"Of Apes there are infinite flocks up and down in the mountains thereabout, a thousand and more together: there they leave no stone unturned. If they meet with one that two or three cannot lift, they call for more, and all for the sake of the wormes that lye under: a sort of dyet which they relish exceedingly. They are very greedy after Emmets; so that having found an Emmet-hill, they presently surround it, and laying their fore paws with the hollow downward upon the Ant-heap, as fast as the Emmets creep into their trecherous palmes, they lick them off with great comfort into their stomachs; and there they will lye til there is not an Emmet left. They are also pernicious to fruit and apples, and will destroy whole fields and gardens unless they be carefully looked after. For they are very cunning, and will never venture in till the return of their spies, which they send always before, and who, giving information that all things are safe, in they rush with their whole body, and make a quick dispatch. Therefore they go very quiet and silent to their prey, and if their young ones chance make

a noise, they chastise them with their fists, but if they find the coast clear, then every one has a different noise to express his joy. Nor could there be any way to hinder them from further multiplying, but that they fall sometimes into the ruder hands of the wild beasts, which they have no other way to avoid but by a timely flight, or creeping into the clefts of the rocks. If they find no safety in flight, they make a virtue of necessity, stand their ground, and filling their paws full of dust or sand, fling it full in the eyes of their assailant, and take to their heels again."

It will be seen that there is much truth and a great deal of romance in this narrative.

The Baboons have had their name given by the Dutch to a plant. The "*Babianer*," which

BABOONS UPON AN ANT-HILL. (*From Job Ludolphus*, 1682.)

botanists have turned into the genus *Babiana*, is a common group of plants which is found in South Africa.

One kind, the *Babiana sulphurea*, greatly resembles in its flower the common Gladiolus of our gardens, but it has round, stiff-coated seeds. The sword-shaped leaves arise from an underground bulb-like root, which buds near its point so as to rise in the ground to the surface, and the flowers are very handsome. The plants flourish in the soil of the great plains of the Cape of Good Hope, where they are exposed for two or three months to rain, but where afterwards and for the rest of the year the earth becomes so dry that hardly a vestige of vegetation remains. The Baboons, when they roamed over these plains formerly, used to dig up the root and eat it voraciously.

The Baboons are more brute-like than the rest of the Monkeys in appearance, and therefore have not that singular resemblance to man which many of the others possess either generally or in their faces. Their dog-shaped head, a long muzzle, and a curious fulness on each side of the long nose, distinguish them at once from any other Quadrumana. With one or two exceptions the nostrils are quite at the end of the muzzle, and are separated by a narrow piece of gristle; they rather project beyond the nostril, and can be placed close to the ground as the Baboon runs along to follow or track a

scent. Their eyes are close together, and are deeply set, their ears are moderately large, and their neck is rather long, and as their common position is squatting on the hinder quarters like a Dog, the long muzzle is kept straight out, or occasionally is hung down over the chest. They have a short body, which seems compressed at the sides, and the shoulders are wide, the chest being capacious. As they run very much like Dogs, the hind-quarters are strong, and the hinder limbs longer than the front ones, and have a decided heel and strong muscles. They trot and canter, but rarely bound or jump over the ground, and they scramble and climb up rocks with the aid of the power of prehension, which is great even in the hinder extremities, the thumb being strong but short. When standing on all-fours, the shoulders are high, and the body slopes slightly to the tail, which is stuck high up, and some have short and others long tails.

They have the cheek-pouches, and the curious callosities on their stern, which sometimes are very large and vividly coloured; and their hair is many-coloured, being long or short according to the species. The tail is curved upwards close to its origin, and then it droops downwards when the Baboon is quiet in mind and body; but when excited, it sticks out and is flourished about with great vigour. Sometimes ended with a tuft, in some kinds it is not, and in one or two of the great Dog-headed there is no tail, or only a miserable rudiment of it. In spite of their brutal looks—for the faces of some are swollen out, or rather the side of the nose, and coloured and ridged in a marvellously ugly manner—they are very interesting, on account of their habits, cleverness, sociability amongst themselves, and their courage. Usually very amiable and full of fun when young, they afford much amusement when kept well and treated with kindness. They like to be petted, and will present their backs to be scratched, and may be taught to beg for food, to hold things, and to play endless tricks. This "jolly" disposition is seen amongst the wild youngsters, who are ever on the watch for an occurrence of mischief and practical joking, the sedate behaviour of their elders affording opportunities for endless mummeries and impudences. What can be more tempting to a young and light-hearted Cynocephalus than to disturb the solemn thoughts of the patriarch of the troop? There sits the elder of elders on his haunches, his tail outspread behind, the long nose slightly stuck up, and the fine long mane, lion-like, encircling the throat and covering the shoulders. Perched upon a block of stone, higher than the rest, he is an object of reverential awe to the elders of the band. But often enough some restless little Ape, after squatting on a stone and mimicking the Nestor of the tribe, forgets himself, and after much dodging here and there, and running to and fro, ventures to pull that sacred tail as only Monkeys pull. All the rage of Thoth is, however, slumbering in that quiet old male. His cares and watchings have triumphed over any gaiety he ever had. Making no allowances for the follies of youth, he pounces without wavering on the offender. Squeals, squeaks, and howls follow the cuffs, pinches, and bites, and the little wretch makes off to the bosom of his mother, who snarls, grins, and shows her teeth, using language awful in monkeydom, and mutterings not loud but deep. The mothers in the immediate neighbourhood sympathise and proclaim their indignation with low grunts and much pantomime suggestive of reprisals, but they all know better than to do anything of the sort, as they have experienced the weight of the paternal arm themselves so often.

With age, any amiability of disposition is replaced by ferocity and greedy brutality, and is particularly increased in captivity, as the temper is usually severely tried by the tricks and teasings of the visitors.

The Cynocephali, although they are placed after the different genera already described in the scheme of classification, have some very singular structural resemblances with the higher Apes and with man, besides those which render them more like the quadrupeds, such as the flesh-eaters or Carnivora. Several of these will be noticed in describing some of the kinds of Baboons; but it may be stated here that the bend in the back observed in the Chimpanzee and other Apes, which resembles that of a very young child more than that of a man, does not exist in these Dog-headed Apes. Their bones bend in and the upper part of the back bends out, as in man, so that there is a more or less graceful double curve. This is evident when any Baboon places himself up against the wires of his cage to be scratched—a treat under all circumstances. Moreover, the Baboon has another human resemblance, which is also observable in the Orangs, but not in the Troglodytes. In man, if a line be drawn down the spine and another drawn down the sacrum bone (that which unites the haunch-bones together behind), they will not meet and form a straight line, but will cut

each other, so as to produce a decided angle. This is slightly seen in the Orangs, but it is very evident indeed in the Baboons. On the contrary, there is no angle formed in the Gorilla and Chimpanzee. Again, in man, the sacrum bone is curved, the hollow of the bend looking forwards. This is the case in the Baboon and also in the Siamang; but the curvature is much less in the great Apes or Troglodytes; furthermore, this sacrum bone is relatively very broad in the Baboon.

Now, these are not simply anatomical curiosities, and they are really of some interest to the youngest naturalist who cares to try and puzzle out what these things really mean. Either they have a meaning or they have not. If they are freaks of Nature or the results of chance, then there is nothing more to be said; or if they are deeply connected with the method of life or the habits of the creatures, they may be said to have been given for a purpose. But the notions about chance and freaks belong to a bygone age, for Nature works neither by accident nor by impulses, but by law. So there must be some meaning in these things, and the key to their comprehension is the gradual change of form and of structure which has been undergone in the long ages during which one animal has become altered so as to depart greatly from the parent stock, and to assume what is called a new specific shape—to become a new kind. And in the new kind there are relics of the old form—pieces of bone here and there; muscles, tendons, or useless teeth, and such things, which are, as it were, part of the coat-of-arms to enable the genealogist to trace the history of the family.

In the Baboons there is a curious condition of the first bone of the neck (the atlas, or first vertebra, on which the head rests). It is a massive ring of bone, down the centre of which the great nerve (spinal cord) of the spine passes, and it becomes stouter with age, and the central hole is all the smaller. It has a small spinous process, to which there is a muscular attachment, which tends to keep up the heavy skull and long nose. A good short back-bone, not over pliant, is necessary to the Baboon, and a provision is made in order to produce this; for the bodies of the vertebræ are found to be larger and longer as they are further down the spine. This is what occurs in man and in the Gibbons, but it is only slightly noticed in the higher Apes—the Troglodytes and Orangs. The Baboon may be said to have sometimes only eighteen back and loin vertebræ, and twelve or thirteen are rib-bearing, and the spines of these bones are strong and often expanded or flattened at their ends; moreover, the last spines project forwards and the others backwards. All this arrangement is especially ape-and animal-like, and refers to the strengthening of the muscles used in moving on all-fours. There is of course a tail to be considered, and in the shortest there are from five to eight bones, or modified vertebræ, and whether short or long, the muscles of the tail are all to be met with at its root.

Such clever animals ought to have well-formed brains, and yet not so elaborately constructed as those of the Anthropomorpha, whose movements are more varied, and who can walk erect for a longer or shorter time. It is found that the brain of the Baboon, although less complicated, or rather less perfectly formed, than that of the Chimpanzee and Orang, is singularly like those of the Guenons and Macaques in the surface markings and convolutions, and, in fact, the brains of these animals agree in all essential points. The principal convolutions and fissures which are noticed in the Troglodytes exist, but the external perpendicular fissure is strongly marked, and all the little brain is covered by the cerebrum, or brain proper.

There is no mistaking a Baboon's skull; it is large for a Monkey, and the face part is always one-half of the whole, the brain-case being cast in the shade, as it were, by the huge upper and lower jaws, and their fine armament of teeth. In old males the length of face is much greater than one-half, and the front of the upper jaw is stuck out considerably. But in all there is a swelling of the upper jaw-bone, just in front of the orbit and on each side of the nose-bones, which sometimes is vast and at others turned into a ridge. It is this which is covered by the curious tints and colours in some. The jaws seem pinched in, just above the upper grinding teeth, and then comes this swelling. Strong teeth exist in the upper jaw, and the canine, or eye teeth, more than an inch in length, are long, slender, curved, and sharp. The front or incisor teeth are large, the middle ones being the largest, and the three grinders have sharp projections on them which are not readily worn. As the eyes are close together, the orbits are only separated by the forehead (frontal) bone and the united nose-bones (nasals). These cavities are, moreover, broad, and look a little outwards, and they open into the strange swollen muzzle. The ridges over the orbits are great, and the opening for the nose is

triangular; the forehead recedes, and is rounded, and the side-bones of the brain-case are bulged out. Underneath, the skull looks very long; the hinder nostril opening is small, and the palate is arched. As the animal eats a variety of food, and fights often, his lower jaw is very strong. It is large and wide behind, and compressed in front. The chin is deep, and so is the side of the jaw close to it, but further back it is less so; and the joint process (condyle) is wide and very flat usually. The lower canines are not as large as the upper, and they fit into a space (diastema) in front of the great canines of the upper jaw. The back teeth are remarkable for their size, the last in the lower jaw having five points, and the others four. The tooth (pre-molar) next to the canine is pushed backwards and sharpened in a curious manner by the action of the great upper canine, which comes down in front of it when the jaw is closed.

The Baboons are found widely dispersed about Africa, and those which have been best observed live on the west coast, on the east in Abyssinia, and extending downwards to the neighbourhood of the Cape of Good Hope. Frequenting mountains and woody places, and rather avoiding forest land, they come within range of the great Carnivora of the plains and uplands, and suffer in consequence, the Leopard especially making the young its prey whenever it has an opportunity. They extend into Arabia. A little black one, differing in its kind from its African congeners, lives in the Island of Celebes, in the Philippines, and in the Islet of Batchian, close by. Some kinds differ but slightly from one another, and those of one part of the African continent appear to resemble those of other portions in their several shapes and habits, and yet to have different-coloured hair, hence much confusion has arisen regarding the races of the species of the genus. This has been increased by the fact that the females differ much from the males, and hence more species have been formed by naturalists than is correct. Probably there are twelve species.

BRAIN OF THE BABOON.

The possession of a good tail constitutes a very good characteristic, and by the presence or comparative absence of this member the group or genus may be divided into two.

In the division which possess a tail, which is never very long, often rather short, and sometimes tufted and sometimes not, are the most numerous species, and such kinds as the Hamadryas, Gelada, Sphinx, and Pig-tailed Baboons are well known. In the nearly tail-less division are the great Mandrill, the Drill, and the Black Baboon.

THE SACRED BABOON, THE THOTH OF THE EGYPTIANS.*

During the march against Magdala and Theodore, in the Abyssinian campaign, this great Dog-faced Baboon was frequently seen, and its habits were noticed by Blanford, the naturalist to the Expedition. Like most, if not all, of its fellow Baboons, this interesting creature prefers sandy ground to the dense forest land. They very rarely are seen on trees, they avoid woods, and keep mainly in the open country, preferring rocky precipices. This was the kind of country principally traversed by the army, and hence the Baboons afforded some amusement during the hot marches, and they were met with everywhere from the plains around Annesley Bay, where the disembarkation took place, to the top of the Dalanta plateau, although most abundantly in the tropical and sub-tropical portions of the district. On rising one morning after a march of some sixteen miles from Annesley Bay, Blanford saw a singular spectacle. A large troop of Baboons, at least two hundred in number, were hunting for any corn dropped upon the ground in the place where the horses had been picketed. They were the first of the great Dog-faced Apes which had been seen, although they became familiar enough afterwards. There was no mistaking them, for their likeness to the engravings of the Sacred Ape

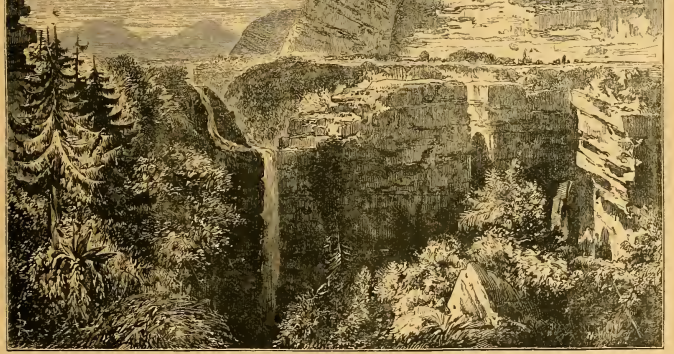
* *Cynocephalus hamadryas.*

CHIMPANZEE. (*See pp.* 49-58.)

(*From the Living Specimen in the Zoological Gardens, London.*)

(Thoth) on Egyptian monuments was exact. The uncouth-looking male is, indeed, a formidable animal, something between a Lion and a French Poodle in appearance, with long hair over his shoulders and fore-parts. Their impudence was excessive, and the day before they had come into the commissariat enclosure and commenced pilfering the grain.

Subsequently the Baboons were found up the country, at an elevation of 9,000 feet, and wherever there were passes leading from the coast to the table-lands, there they abounded, and it was evident that they kept close to the sides of the rocky ravines. The herds vary in number; some cannot include less than 250 to 300 Monkeys of all ages. The old males are always most conspicuous animals, all the fore-part of their body being covered with long hair. They usually take the lead when the troop is moving, some of them also bringing up the rear; others placing themselves on high rocks or



VIEW IN ABYSSINIA.

bushes, and keeping a sharp look-out after enemies. A troop collected on a rocky crag presents a most singular appearance. Sometimes large numbers were seen assembled round springs in the evening near Senafé, where the want of water was great. On such occasions, every jutting rock and every little stone more prominent than the rest was occupied by a patriarch of the herd, who sat with the gravity and watchfulness befitting his grizzled hair, waiting patiently till the last of his human rivals had slaked his thirst and that of his cattle. Around, the females were mainly occupied in taking care of the young, the smaller Monkeys amusing themselves by gambolling around. Occasionally, if a young Monkey became too noisy, or interfered with the repose of one of his seniors, he "caught it" in most unmistakable style, and was dismissed with many cuffs, a wiser if not a better Monkey.

The Baboon feeds on wild fruits, berries, and seeds, and often on the buds of trees and on young shoots. On the highlands, troops of them were frequently seen in the fields, engaged in searching for a small tuber, the root of the edible *Cyperus*, which was also the resource of the half-starved men and women in the country of the Tigré.

These Baboons climb heavily and clumsily, but run, or rather gallop, well and steadily, without

bounding movements, and hence their locomotion differs much from that of many kinds of Monkeys. Doubtless they unite in such large troops in order to defend themselves against their enemies, and the old males are combative and grave. From their size and great power of jaw they are most formidable antagonists, and their boldness in resenting injury is said to be in proportion to their power. There are many stories of their attacking men. During the time before the Abyssinian Expedition sailed, a well-known German and two companions were surrounded by a large herd, which barred their path, and were so threatening that he was obliged to shoot one in self-defence. Even then, although they fell back, they did not run away. On the other hand, there were no instances known of these Baboons attacking any other of the expeditionary force. Near the passes the Baboons became very wary, for they were often fired at.

The Hamadryas Baboons are not entirely vegetable feeders, although they usually live on fruits and grain, or on buds and succulent stems; yet it appears to be true that they like insects now and then, and share them as delicacies. The old ones march about gravely, turning over stone after stone, but if there is a large stone which one cannot turn over, as many as can stand round it turn it with a will together, capsize it, and share the booty. The old males, who act as sentinels, are extremely watchful, and cry out with a peculiar note when there is danger; but this is only done when absolutely requisite, for silence is insisted on during their expeditions. Thus, when they plunder a garden in Abyssinia, they follow their leader without noise, and if an impudent young one makes a noise he receives a slap from the others to teach him silence and obedience. But as soon as they are aware that there is no danger, all show their joy by making as much noise as possible.

The Hamadryas grows to the size of a large Pointer Dog, and measures rather more than four feet when standing erect, and about two feet and a half when sitting. The face is very long, naked, and of a dirty flesh-colour, with a ring of lighter tint round the eyes. The nostrils, as in the Dog, are separated by a slight furrow, and they open quite at the end of the snout, which projects slightly beyond the lip. The head, neck, shoulders, and all the fore parts of the body as far as the loins are covered with long shaggy hair; that on the hips, thighs, and legs is short, and contrasted with the former has the appearance of having been clipped, so that the whole animal bears some resemblance to a French Poodle. The hair of the back of the head and neck is upwards of a foot in length, and forms a long mane which falls back over the shoulders, and at a distance looks something like a full short cloak. The whiskers are broad and directed downwards so as to conceal the ears; their colour, as well as that of the fore part of the body, head, and mane, is a mixture of light grey and dusky colour, each hair being marked with numerous delicate rings of the colours. The short hair of the thighs and extremities is of a uniform colour of dusky brown, and a dark brown line passes down the middle of the back. The feet are rusty brown, and the hands are jet black. The tail is about one-half of the length of the body, and is carried drooping as in other Baboons; it is terminated by a tuft of long brown hair.

The female equals the male in point of size, but has no mane, being uniformly covered with short hair of deep olive-brown slightly mixed with green. She has a bearish look, and it is evident that the colours of both sexes are admirably adapted to hide them when crawling amongst rocks, or hiding away in holes and under ledges of stone. All have a wild, grunting bark, almost approaching a roar; and they possess laryngeal pouches or air sacs, which pass amongst the muscles of the neck and reach even into the armpits. The pouch communicates by one opening into the membrane above the larynx, and between its cartilage and the so-called hyoid bone at the base of the tongue, and they, therefore, resemble those of the Semnopitheci.

Mansfield Parkyns gives some very interesting and explicit statements about the intelligence and discipline of the Baboons. He says—"The Monkeys, especially the Cynocephali, who are astonishingly clever fellows, have their chiefs, whom they obey implicitly, and a regular system of tactics in war, pillaging expeditions, robbing cornfields, &c. These Monkey forays are managed with the utmost regularity and precaution. A tribe coming down to feed from their village on the mountain (usually a cleft in the face of some cliff) brings with it all its members, male and female, old and young. Some—the elders of the tribe distinguishable by the quantity of mane which covers their shoulders, like a Lion's—take the lead, peering cautiously over each precipice before they descend, and climbing to the top of every rock which may afford a better view of the road before them. Others have their

posts as scouts on the flanks or rear, and all fulfil their duties with the utmost vigilance, calling out at times, apparently to keep order among the motley pack, which forms the main body, or to give notice of the approach of any real or imagined danger. Their tones of voice on these occasions are so distinctly raised, that a person much accustomed to watch their movements will at length fancy—and perhaps with some truth—that he can understand their signals.

"The main body is composed of females, inexperienced males, and the young of the tribe. Those of the females who have small children carry them on their back. Unlike the dignified march of the leaders, the rabble go along in a most disorderly manner, trotting on and chattering without taking the least heed of anything, apparently confiding in the vigilance of their scouts. Here a few of the youth linger behind to pick the berries off some tree, but not for long, for the rear-guard coming up forces them to regain their places. Then a matron pauses for a moment to suckle her offspring, and not to lose time dresses its hair whilst it is taking its meal. Another younger lady, probably excited by jealousy, or by some sneering look or word, pulls an ugly mouth at her neighbour, and then, uttering a shrill squeal highly expressive of rage, vindictively snatches at her rival's leg or tail with her hand, and gives her, perhaps, a sharp bite in the hind-quarters. This provokes a retort, and a most unladylike quarrel ensues, till a loud bark of command from one of the chiefs calls them to order. A single cry of alarm makes them all halt and remain on the *qui vive* till another bark in a different tone reassures them, and they then proceed on their march.

"Arrived at the cornfields, the scouts take their position on the eminences all around, while the remainder of the tribe collect provision, with the utmost expedition, filling their cheek-pouches as full as they can hold, and then tucking the seeds of corn under their armpits. Now, unless there be a partition of the collected spoil, how do the scouts feed? for I have watched them several times, and never observed them quit for a moment their post of duty till it was time for the tribe to return, or till some indication of danger induced them to take to flight. They show also the same sagacity in searching for water, discovering at once the places where it is most readily found in the sand, and then digging for it with their hands just as men would, relieving one another in the work, if the quantity of sand to be removed be considerable. Their dwellings are usually chosen in clefts of rocks, and are always placed so high that they are inaccessible to most other animals, and sufficiently sheltered from the rain. The Leopard is their worst enemy, for being nearly as good a climber as they, he sometimes attacks them, and then there is a tremendous uproar. I remember one night, when outlying on the frontier, being disturbed in my sleep by the most awful noises I ever heard, at least they appeared as such, exaggerated by my dreams. I started up thinking it was an attack of negroes, but soon recognised the voices of my Baboon friends from the mountain above. On my return home I related the fact to the natives, who told me that a Leopard was probably the cause of all this panic. I am not aware how he succeeds amongst them. The people say that he sometimes manages to steal a young one and make off, but that he seldom ventures to attack a full-grown Ape. He would doubtless find such an one an awkward customer; for the Ape's great strength and activity, and the powerful canine teeth with which he is furnished, would render him a formidable enemy, were he, from desperation, forced to stand and defend his life. It is most fortunate that their courage is only sufficiently great to induce them to act on the defensive. This indeed they only do against a man when driven to it by fear, otherwise they generally prefer prudence to valour. Had their combativeness been proportioned to their physical powers, coming as they do in hordes of two or three hundred, it would have been impossible for the natives to go out of the village, except in parties, armed, and instead of little boys, regiments of armed men would be required to guard the cornfields."

A traveller, relating his experience with these Baboons, writes as follows:—

"The first band I saw was just resting after their morning ramble. I had seen the tall forms of the males from some distance, but had taken them for rocks, as these Apes resemble them when they are still. I was first undeceived by a repeated cry, which sounded like a shrill cry of 'Kuck.' All heads were turned our way, and only the young ones went on with their games. Probably the whole herd would have stopped in this attitude had not we had two Dogs with us that we kept to keep off hyænas from the house. These answered the cries of the Apes, and we immediately noticed a commotion among the herd. They started off and disappeared. Much to our astonishment, at the next bend of the road, we saw the whole band in a long row clinging on to what seemed a perpendicular

rock. This was too much for us, and we determined to have a shot at them. Unfortunately, the rock was too high for a sure aim. Anyhow, we hoped to disturb them. The first shot had a wonderful effect. A tremendous barking and shrieking was the answer. Then the whole band moved on, climbing over the rocks in a most astonishing manner, where it seemed almost impossible to find a footing. We fired about six shots, though it was impossible to be sure of hitting. It was most comical to see the whole band, at every shot, cling on to the rock as if they thought the earth would give way under them. The next turn we found them no longer on high ground, but in a valley where they were going through to get to the hills beyond. Part of the band had crossed, but most were still behind. Our Dogs stopped a minute, and then rushed in among the herd. So soon as they got there all the old males rushed from the rocks, formed a circle round the Dogs, and opened their

SACRED BABOON.

mouths, beat the earth, and looked so fierce, that the Dogs retreated with all speed. Of course, we encouraged them to return to the fight, and in the meanwhile the Apes had got across the valley. As the Dogs returned to the attack there were only a few in the valley, and among them a young one of about six months old. As it saw the Dogs it cried out, and fled to the rocks, where our Dogs brought it to bay, and we flattered ourselves that we should catch it. Proudly and quietly, without troubling himself about us, came an old male back from the other side, walked fearlessly between the Dogs, climbed slowly up the rock, and took off the young one in triumph."

Their regard for their mutual safety is even seen in captivity, for it has happened that when a Baboon, who has been extremely savage, unbearable, and mischievous in his comportment, had to be chained to be punished, the others tried to protect him.

"Many kinds of Monkeys," writes Mr. Darwin, "have a strong taste for tea, coffee, and spirituous liquors; they will also, as I have myself seen, smoke tobacco with pleasure." The wild Baboons of North-eastern Africa are often caught in consequence of their naughty propensity and love of a "drop." The natives fill some vessels with strong beer, and put them out in places where they

look particularly tempting to the thirsty. The Baboons, ever on the watch for something new and to steal, see the pitchers and pans, and of course just taste their contents. Feeling happy and enlivened, after a while they try again, and finally drink long and deeply, becoming in a short time decidedly tipsy, and unable to take care of themselves. Drunk and incapable would be the accusation against them by native police. Unfortunately for the tipplers their punishment is greater than the crime; and not only do they suffer all the miseries of headache, thirst, and bodily depression, but they lose their liberty also, and not for a time only. The natives, knowing that after a few hours they may expect to find the Baboons incapable of biting, fighting, or running away, go out and search for their victims, and bring them home and place them in durance vile. The next morning they awake to a sense of their condition. They hold their aching heads with both hands, and look with a most pitiable

YOUNG HAMADRYAS. (*From the Zoological Gardens.*)

expression. Brehm saw some of them in this plight, and gives a most amusing description of their grimaces and laughable conduct. A little wine or beer was offered to some who had recovered from their debauch, but they would have nothing to do with it at the time. They turned away with disgust, but they relished the juice of some lemons which was given to them.

The Baboons, symbolical of learning, the observers of the moon in eclipse, and the companions of the bacchanalian jug, once so esteemed, worshipped, and mummified by the ancient Egyptians, have terribly fallen in social and religious reputation on the very spot of their former glories. In modern Egypt they may be seen in some houses where, at a fanciful kind of banquet, they have to sit around the room holding torches. And right bad torch-bearers they are, for every now and then some Baboon becomes aggressive, or some guest has a nice piece on his plate for which the Baboon longs, and the consequences are a departure of the light from its perpendicular, a slight motion amongst the row of curious candelabra, and oftentimes such disorder as can only be remedied by the timely application of the discipline of the stick. They are carried about to do tricks, and brutalised in every way.

Mansfield Parkyns asserts that the cleverness of these Baboons depends in some measure upon their power of reason, and not entirely on that instinct with which all animals are endowed, and which serves them only to procure the necessaries of life and to defend themselves against their enemies. In proof he relates an incident, of which he was an eye-witness. "At Khartûm, the capital of the provinces of Upper Nubia, I saw a man showing a large male and two females of this breed, who performed several clever tricks at his command. I entered into conversation with him as to their sagacity, the mode of teaching them, and various other topics relating to them. Speaking of his male Monkey, he said that he was the most dexterous thief imaginable, and that every time he was exhibited he

VILLAGE IN NUBIA.

stole dates and other provisions sufficient for his food for the day. In proof of this he begged me to watch him for a few minutes. I did so, and presently the keeper led him to a spot where a date-seller was sitting on the ground with his basket beside him. Here his master put him through his evolutions, and although I could perceive that the Monkey had an eye to the fruit, yet so completely did he disguise his intentions, that no careless observer would have noticed it. He did not at first appear to care about approaching the basket, but gradually brought himself nearer and nearer, till at last he got quite close to the owner. In the middle of one of his feats he suddenly started up from the ground on which he was lying stretched out like a corpse, and uttering a cry as if in pain or rage, fixed his eyes full on the face of the date-seller, and then, without moving the rest of his body, stole as many dates as he could hold in one of his hind hands. The date man, being stared out of countenance, and his attention diverted by this extraordinary movement, knew nothing about the theft till a bystander told him of it, and then he joined heartily in the laugh that was raised against him. The Monkey having

very adroitly popped the fruit into his cheek-pouches, had moved off a few yards, when a boy in the crowd round him pulled him sharply by the tail. Conscience-stricken, he fancied that it had been done in revenge by the date-seller whom he had robbed; and so, passing close by the true offender and behind the legs of two or three others, he fell on the unfortunate fruiterer, and would no doubt have bitten him severely, but for the interference of his master, who came to the rescue."

Although so clever, the Hamadryas is much more deficient in brain than the higher Apes, the Orang for instance. It is not so much developed in front, and the whole mass is not so high, but still it projects well over the little brain, or cerebellum. The convolutions are simpler, and although all the principal markings noticed even in man are present, still the smaller ones, and those which belong to structures which add to the superficial extent of the organ, are wanting. The ventricles and the posterior horn and its eminences are present, as is also that particularly monkey development, the fissure, which is called the external perpendicular.

Evidently the compressed form of the skull, which seems as if it had been pressed far above over the forehead, has much to do with the small bulk of the front of the brain, and this is also diminished by the projection of the orbits into the brain-case. The skull is certainly an ugly thing to look at, and is only surpassed by that of the full-grown Mandrill in want of elegance, of outline, and smooth configuration. The forehead and top of the skull are broad and flat, and the whole brain-case appears to slope off at the sides of the orbits, and then projects but little there, the broadest part of the skull being at the cheek-bone. The orbits are oblique, that is to say, they look forwards and outwards, and they are tolerably widely open. There is a great roundness and swelling of the upper jaw-bone from the cheek-bone to the long nasal bones, and the front jaw-bone (the pre-maxillary) is short and projecting. The shape of the skull resembles that of the Sphinx Baboon.

Their name, given to them by the naturalist, is as great a puzzle as are many others devoted to animals, for what possible connection can there be between the Hamadryads, the nymphs whose birth, life, and death were mysteriously united with the corresponding epochs in the growth of the oak-tree, and a most un-nymphlike creature which likes rocks, holes, and dens, but who neither cares for oaks nor acorns!

THE GELADA BABOON.*

These Baboons are quite as clever as the great Dog-faced kind, which has been immortalised by the ancient Egyptians, and every now and then troops of both come in contact and have great fights. The Gelada Baboon, with its long tail tufted at the end, and black limbs, has very long hair on its upper parts of a pale brown colour. This covers the head where there is a dark line from the forehead backwards, and also the shoulders and rump. This Baboon, moreover, has the nostrils opening high up in the face, and not close to the end of the upper jaw, as in the Hamadryas. Differing thus from the Hamadryas Baboons, each troop soon knows its comrades. Occasionally, when the fields are ripe with grain, the Geladas, perched upon their mountain homes, see the glowing and varied colours of the vegetation, and long for the luxuries of the plains. They descend and sometimes rob the farmers with impunity, and return after having committed a vast amount of mischief. But it happens that the great Dog-faced troops are out on the same errand, and the two sets of thieves speedily disagree. A fight ensues, and the Geladas roll down large stones, which the others try to avoid, and then they all rush together to close quarters, making a great uproar, and fighting with great fury. Some of these gallant Geladas had the audacity to stop a Serene Highness in his travels in Abyssinia, and very effectually, for some hours. A Duke of Coburg-Gotha was in a caravan which had to traverse the pass of Mensa, in Abyssinia, and as there were some of the Baboons perched in numbers on the sides of the high rocky ravine, some of the Europeans, who of course must try and kill something as often as possible, fired upon them. The Baboons retaliated in a most military manner, by rolling down stones in such quantity and of such a size that not only had the firing party to retire, but the passage of the caravan was stopped. They positively closed the pass against all comers for some time.

Darwin tells a laughable anecdote of a Baboon, but does not mention the kind. He saw in the Zoological Gardens a Baboon who always got in a furious rage when his keeper took out a letter or

* *Cynocephalus gelada.*

book and read it aloud to him; and his rage was so violent that, as Mr. Darwin witnessed, on one occasion he bit his own leg till the blood flowed.

THE PIG-TAILED BABOON, OR CHACMA.*

The Hottentots are familiar with one of the largest kinds of the Baboons, which reaches the size of an English Mastiff, and has superior strength, and they call it the Tchackamma, which has been reduced by Europeans to the "Chacma." The colonists of the Cape of Good Hope districts called it the Black Ape, and then, from some fanciful resemblance of its tail to that of a Pig, the creature was dignified with the name *porcarius*.

The Chacmas are found in great troops, and they behave very much after the manner of the other large Baboons, their strength rendering them a terror to the Dogs of the colonists. In ascending the kloofs, or passes, in the mountains of South Africa, which are frequently steep, narrow, and dangerous, travellers often disturb great troops of these animals, which have been sunning themselves on the rocks. If not attacked they scamper up the sides of the mountains yelling and screaming. They resent being fired upon by rolling down stones.

The Chacma has a fine black tail, which is rather more than half the length of the body, and it has a tuft of long black hair at its tip. It is carried like that of the other long-tailed Baboons, being curved upwards at first, and then falling down straight. Nearly all the fur of the body is a uniform dark brown, almost black, mixed throughout with a dark green shade. It is long and shaggy, particularly on the neck and shoulders of the males. If a solitary hair be pulled out, it will be found to be very curiously ornamented. It has a root, like all hairs, springing from a little pimple under the scarf-skin, and its colour is at first of a light grey colour. Then it is marked with wide rings of colour, which are perfectly distinct, and they are alternately black and dark green, but sometimes they are intermixed with a few of a lighter or yellowish shade. The face and ears are naked, as are also the palms and soles, and there are small whiskers, grey in colour and brushed backwards. Naked as are the face, ears, and hands, the skin is of a very dark violet-blue colour, with a pale ring surrounding each eye. Strange to say, the upper eyelids are white.

In the adult the muzzle is very long in comparison with the skull, which is greatly flattened and contracted; but in the young, the size of the nose is not so apparent, and the head is rounder, and the brain case is larger in proportion. As age comes on, the brain is not increased in size correspondingly with the face.

There is no doubt that the old Baboons have a very fine sense of smelling, their noses are large, and the sentient surface is great; moreover, this gift has been tested and used to the advantage of many a wanderer and settler in the districts where water is scarce at the surface, but plentiful here and there, resting on rocks which are covered with sand or soil. The Baboon can find out water when even the Bushmen are quite at fault, and when other animals are dying of thirst. When a manageable Baboon is at hand, and people are in a dreary district searching for water, they lead him in the required direction suffering from thirst, and give him his liberty. He moves over the ground quickly, smelling here and there, or gallops with extended nostrils, now turning in one direction and now in another, quartering out his ground like a Dog. Sooner or later he stops and begins to dig with his hands, and then the people come up, and water is almost always found, and in quantity.

Although the young Chacmas are playful enough, and are full of nonsense and fun in captivity, they, like all their kindred Baboons, become surly, ferocious, and unsafe as they grow old and have their bodies perfectly developed to the perfection of baboonism. That is to say, when the face, jaws, and teeth become as large as they ever will be, and the body becomes as short and as muscular as possible. They then scowl at the visitor, and grind and show their great teeth at the slightest provocation, grumbling and growling also, and in fact, to quote the words of a very precise naturalist, "the fierceness and brutality of their character and manners correspond with the expression of their physiognomy." Nevertheless, they are amenable to soft influences. In spite of their savage and untamable disposition, they are influenced by that most potent of all attractions. They are, in the language of the writer just quoted, "agitated by the passion of love or jealousy. In captivity they

* *Cynocephalus porcarius.*

are thrown into the greatest agitation at the appearance of young females"—not females of the Baboon tribe, but those who, under all circumstances, are now called ladies. "It is a common practice," continues the writer, "among itinerant showmen, to excite the natural jealousy of these Baboons by caressing or offering to kiss the young females who resort to their exhibitions, and the sight never fails to excite in these animals a degree of rage bordering on frenzy. On one occasion a large Baboon of this species escaped from his place of confinement in the Jardin des Plantes at

PIG-TAILED BABOON.

Paris, and far from showing any disposition to return to his cage, severely wounded two or three of his keepers who attempted to recapture him. After many ineffectual attempts to induce him to return quietly, they at length hit upon a plan which was successful. There was a small grated window at the back part of the den, at which one of the keepers appeared, in company with the daughter of the superintendent, whom he appeared to kiss and caress within view of the animal. No sooner did the Baboon witness this familiarity, than he flew into the cage with the greatest fury, and endeavoured to unfasten the grating of the window which separated him from the object of his jealousy. Whilst employed in this vain attempt, the keepers took the opportunity of fastening the door, and securing him once more in his place of confinement. Nor is this a solitary instance of the influence which women can exert over the passions of these savage animals. It is said that, generally un-

tractable and incorrigible whilst under the management of men, it usually happens that Baboons are most effectually tamed and led to even more than ordinary obedience in the hands of women, whose attentions they often repay with gratitude and affection."

There is another side to the picture, however, and probably about as true. "Travellers sometimes speak of the danger which women run who reside in the vicinity of the situation which these animals inhabit, and affirm that the negresses on the coast of Guinea are occasionally kidnapped by the Baboons; we are even assured that certain of those women have lived among the Baboons for many years, and that they were prevented from escaping by being shut up in caves in the mountains, where, however, they were plentifully fed, and in other respects treated with great kindness! It is to be observed, however," writes this author, "that these accounts rest upon authority which is by no means unexceptionable; credible and well-informed modern travellers do not relate them, and even their older and more credulous predecessors give them only from hearsay."

There is a curious connection between the growth of the hair on some parts of Monkeys and their combative habits. Thus these Baboons have a long mane, and that of the male is, of course, the longer; and these are perhaps the only Apes which seize each other by the nape of the neck with their long canine teeth, the males being the fighters. The mane, then, is clearly of advantage. On one occasion this propensity displayed itself on one of the higher animals who was not thus protected, in an attack by a Baboon on one of the keepers at the Zoological Gardens, the keeper unfortunately having no clothes on the back of his neck to act as a mane. The man was stooping down, when the Baboon suddenly pounced on him, and bit him most severely and dangerously in this exposed spot. During this savage and unexpected attack, the affectionate impulses of a little Monkey were of great use and service, for, seeing its keeper in danger, it bit the brute, and screamed in such a manner as to distract its attention, and to allow the man to escape.

All the Chacmas, however, are not furiously jealous, or fighters, or kidnappers of women, for many have excellent memories of kindnesses, and do not fail to express their gratitude. Thus Sir Andrew Smith was recognised by a Baboon at the Cape of Good Hope, with much evidence of satisfaction, after he had been absent for nine months. The females are also often very tender and affectionate. One of them, an old female, adopted a little Rhesus Monkey, and took all sorts of care of it; but when a young Drill and Mandrill were placed in the cage she seemed to perceive that those Monkeys, though distinct species, were her nearer relations, for she at once rejected the Rhesus, and adopted both of them. The young Rhesus was greatly discontented at being thus rejected, and it would, like a naughty child, annoy and attack the young Drill and Mandrill wherever it could do so safely; this conduct exciting great indignation in the old Baboon. Another female Baboon had so capacious a heart that she not only adopted young Monkeys of other species, but stole young Dogs and Cats, which she continually carried about. Her kindness, however, did not go so far as to share her food with her adopted offspring. An adopted kitten scratched this affectionate and selfish old thing, who certainly had a fine intellect, for she was much astonished at being scratched, and immediately examined the kitten's feet, and without more ado bit off the claws!

Le Vaillant in his African travels was accompanied by a Monkey, which was probably one of these Chacmas. It lived on very good terms with cocks and hens, thus disproving the antipathy which tradition has handed down as existing between these very different creatures. He was amused at the one, and stole the eggs of the other. In fact, he not only tasted the eggs of his own accord, but was made to taste all sorts of fowls and nuts for the benefit of the travellers, who feared being poisoned. If this creature, which was called "Kees," refused them, they were left untouched by those who had a very sensible opinion of his instinct. Besides being taster he was watch-dog. "By his cries," writes the traveller, "and other expressions of fear, we were always informed of the approach of an enemy before my Dogs could discover it. They were so accustomed to his voice, that they slept in perfect security, and never went the rounds, on which account I was very angry, fearing that I should no longer find that indispensable assistance which I had a right to expect if any disorder or fatal accident should deprive me of my faithful guardians. However, when he had once given the alarm, they all stopped to watch the signal, and on the least motion of his eyes, or the shaking of his head, I have seen them all rush forward, and run far away in the quarter to which they observed his looks directed. I often carried him along with me in my hunting excursions, during which he would amuse himself climbing

up the trees in order to search for game, of which he was remarkably fond. Sometimes he discovered honey in the crevices of rocks, or in hollow trees, but when he found nothing, when fatigue and exercise had whetted his appetite, and when he began to be seriously oppressed with hunger, a scene took place which appeared to me exceedingly comic. When he could not find game or honey, he searched for roots, and ate them with relish, especially one of a particular species, which, unfortunately for me, I found excellent and very refreshing, and which I wanted greatly to partake of. But Kees was very cunning. When he found any of this root, if I was not near him to claim my part, he made great haste to devour it, having his eyes directed all the time towards me. By the distance I had to go before I could approach him he judged of the time that he had to eat it alone, and I indeed arrived too late. Sometimes, however, when he was deceived in his calculation, and when I came upon him sooner than he expected, he instantly endeavoured to conceal the morsels from me; but by means of a blow well applied I compelled him to restore the theft; and in my turn becoming master of the envied prey, he was obliged to receive laws from the offended party. Kees entertained no rancour or hatred, and I easily made him comprehend how detestable was that base selfishness of which he had set me an example. To tear up these roots Kees employed an ingenious method, which afforded me much amusement. He laid hold of the tuft of leaves with his teeth, and pressing his four paws firmly against the earth, and drawing his head backwards, the root generally followed. When this method did not succeed, he seized the tuft as before, as close to the earth as he could, then throwing his heels over his head, the root always yielded to the jerk he gave it. In our marches, when he found himself tired, he got upon the back of one of my Dogs, which had the complaisance to carry him for whole hours together. One only, which was larger and stronger than the rest, ought to have served him for this purpose; but the cunning animal well knew how to avoid this drudgery. The moment he perceived Kees on his shoulders, he remained motionless, and suffered the caravan to pass on, without ever stirring from the spot. The timorous Kees still persisted; but as soon as he began to lose sight of us he was obliged to dismount, and both he and the Dog ran with all their might to overtake us. For fear of being surprised, the Dog dexterously suffered him to get before him, and watched him with great attention. In short, he had acquired an ascendency over my whole pack, for which he was perhaps indebted to the superiority of his instinct; for among animals, as among men, address often gets the better of strength. While at his meals Kees could not endure guests; if any of the Dogs approached too near him at that time, he gave them a hearty blow, which these poltroons never returned, but scampered away as fast as they could. It appeared to me extremely singular, and I could not account for it, that next to the Serpent, the animal which he most dreaded was one of his own species; whether it was that he was sensible that his being tamed had deprived him of great part of his faculties, and that fear had got possession of his senses, or that he was jealous and dreaded a rivalry in my friendship. Sometimes he heard others of the same species making a noise in the mountains; and notwithstanding his terror, he thought proper, I know not for what reason, to reply to them. When they heard his voice they approached; but as soon as he perceived any of them he fled with horrible cries; and running between our legs, implored the protection of everybody, while his limbs quivered through fear. We found it no easy matter to calm him: but he gradually resumed after some time his natural tranquillity. He was very much addicted to thieving, a fault common to almost all domestic animals; but in Kees it became a talent, the ingenious efforts of which I admired, and notwithstanding all the correction bestowed on him by my people who took the matter seriously, he was never amended. He knew perfectly well how to untie the ropes of a basket to take provisions from it; and, above all, milk, of which he was remarkably fond; more than once he has made me go without any. I often beat him pretty severely myself; but when he escaped from me, he did not appear at my tent till towards night. "Milk in baskets!" why truly the term "basket," as applied to a vessel for holding milk, appears to require some explanation; but it was really carried in baskets woven by the

SKULL OF THE CHACMA.

Yonaquas, of reeds so delicate and so close in texture that they might be employed in carrying water or any liquid. The abstraction of the milk may be considered as a kind of set-off against the appropriation of Kees's favourite root by his master. The pertinacious way in which Kees bestrode Le Vaillant's Dogs will recall to the remembrance of some a Monkey that was, and perhaps still is, riding about London in hat and feather, with garments to match, upon a great Dog, with the usual accompaniment of hand-organ and Pan's pipe. Upon these occasions the Monkey evidently feels proud of his commanding position; but ever and anon we have seen him suffer from one of those sad reverses of fortune to which the greatest among us are subject. In the midst of the performance, while the organ and pipe are playing, and the Monkey has it all his own way, and, elevated with the grandeur that surrounds him, is looking in a supercilious manner at the admiring crowd, some good-natured but unlucky boy throws the Dog a bit of cake, in his zeal to pick up which the latter lowers his head and shoulders so suddenly as infallibly to pitch his rider over his head. We have thought more than once that there was a sly look about the Dog as he regarded the unseated Monkey, utterly confounded by his downfall, and the accompanying shouts of laughter from the bystanders.

The Pig-tailed Baboon being very clever, very agile, and able to use his jaws admirably in digging, eating, and fighting, should have a good skull, and certainly that of an adult, although useful is extremely ugly. The brain-case is even for a Baboon small in comparison with the rest of the skull, and it is hidden in front by the large prominences over the orbits; it swells out behind, and is marked by a side crest, which passes backwards to meet that of the other side from above each ear. The orbits are separated by a straight (vertical) ridge of bone, which gives a curious look to the face, and makes the eyes look straight to the front along the swollen nose. The openings for the nostrils in the skull (anterior nares) are large and rather oval, and the upper jaw is as it were nipped in above the grinders, and then swollen out above. The long nose bones (nasals) are separated by a slight depression from the great ridges of the upper jaw. The huge upper canine teeth are most extraordinary. They are slim, slightly curved, long (1½ inch), and sharp at the tip; when examined they are almost rapier-shaped or triangular in outline, the front of the triangle is grooved, and the back is a sharp cutting edge. The groove is for the top of the lower canine which works into it, and the sharp edge behind cuts upon the tooth in the lower jaw behind the lower canine (the first pre-molar), pushing it backwards and displacing it. These fangs are very terrible to look at, and yet it appears that their principal work is done with the back edge of the upper one grinding and cutting on the curiously-started tooth of the lower jaw. They are capital holders, root-cutters, and nut-crackers.

THE SPHINX BABOON.*

There is nothing much more amusing than to see a young Sphinx Baboon just a little irritated by some one who knows him. They are fine large creatures even when young, and have then an amiable expression of countenance, which they lose with the cares of old age. Greatly resembling the young of the Chacma, they have much the same disposition for play, and can be made a little jealous and fierce. Their colour differs, for their black face is encircled by a dark hair with a decided greenish tint, which is very universal, and upon this they appear to be arranged as different in kind. One in the Zoological Gardens was very active, running on all-fours well, and climbing up the wires of his cage to look at his neighbours. He would come to the side, and on being asked whether he would have a scratch, turned round and placed his back at the disposal of the scratcher, whose operations he much enjoyed; moreover, he put out his hands and feet for examination, and was very quiet. But he had a trick which was not only curious but instructive, as it explained how these Baboons can throw stones, and with good aim. Somebody who knew him came to see him with a lady and offered him a greengage, and when he was about to take it, pretended to give it to her. This excited the indignation of the Sphinx, who trotted off to the further end of his cage and seized a tin pot, which sometimes contained food or water. Taking it in both hands he ran towards the lady and threw it forcibly, and in a good line, at her. He followed his pot, and as it came back by

* *Cynocephalus sphinx.*

rebounding from the wires he escaped it by straddling his legs. Then he came to the side and scolded much, and looked much put out. He soon forgave the injury, and submitted to having his back scratched with pleasure. Then the greengage was offered again, and before he could take it the fruit was presented to a Baboon in the next compartment. This led to the same result—a rush off to the end of the cage, a rummage for the pot, and a very good throw with both the hands. At length, when he had the fruit given to him he was perfectly content. His looks at the lady were certainly cross and angry enough. Evidently there is a good power of aiming, and as the object is thrown as the Baboon is moving it receives a considerable impetus.

The Sphinx Baboon, or *Cynocephalus sphinx*, inhabits Guinea, and is commonly seen in menageries, and stuffed in museums. As old age comes on its character alters as well as its aspect of countenance; it ceases to be familiar and becomes morose and ferocious. The skull of the Sphinx Baboon resembles, to a certain degree, that of the Hamadryas Baboon, but the orbits are decidedly oblique. There is the same filling up of the upper jaw-bones, and the cheek-bones do not project very much.

THE ANUBIS BABOON.*

These Baboons live a very peculiar life in the neighbourhood of Angola, a Portuguese settlement on the western coast of Africa. Instead of delighting in the dense woods and glades of the tropical country close by, where fruit, nuts, and roots exist in vast abundance, and where water is most plentiful, they prefer to inhabit a hilly district which is much cut up in all directions by deep dry gullies, and grand rocky ravines. The country is badly supplied with vegetation, and water is very scarce. There are a few prickly shrubs, a few roots of grass, and certain kinds of thick club-stemmed dwarf shrubs all bearing a few leaves, only during the few months of the year in which rain falls. During the rest of the year nothing is seen but bare rock and scorched leafless firewood. At distances far apart, water only exists in deep dry gullies under the sand. In the neighbourhood of the rivers on that part of the coast vegetation is most luxuriant, but the Monkeys prefer the arid country, living principally on the root and stem of one of the most extraordinary plants in the world—the Welwitschia.

SKULL OF THE ANUBIS BABOON.

The dog-like jaws of these Apes are very useful in gnawing the exposed roots of these plants, and they manage to nibble them just as a Sheep does a turnip. When thirsty they seek for water, and in company with Zebras and other animals excavate or scrape holes in the sand until it is found over the hard sub-rock.

They are very wary, and usually assemble in troops of fifteen or more, and when they move about they send forward one or two who act as scouts, and give signals to the main body about what is going on in front. Some time since a man opened a well at some copper-mines on the hills, and he soon found that the Baboons knew what he had done, for they came down to drink in bodies of thirty or forty.

They run very fast and on all-fours in a kind of sideway gallop, and the little ones ride on the backs of their dams, holding very tight and safely. It appears that there is some discipline going on amongst them when they are in bodies, for if a scout should happen not to signal danger or whatever is interesting to the whole band, the rest set upon him, and give him a good thrashing.

Some similar or perhaps the same kind of Baboon lives a more pleasant life than these in another district in the neighbourhood of Angola. There are some most extraordinary rocks which are situated some two hundred or more miles in the interior, and were mentioned more than two centuries ago in the books of missionaries and other travellers as great wonders of nature. They are the Black Rocks of Pungo Andongo. These rocks, rising on the outskirts of a district celebrated for

* *Cynocephalus anubis.*

its marvellous fertility and richness of vegetation, are arid-looking on the top, and dark, partly from the natural tint of the stone which is composed of gneiss. They encircle a valley, and extend over about ten square miles, being rugged, or in the form of gigantic pillars. Sloping away from the valley region with its great forests, they present precipitous sides towards it, and are broken up by ravines.

At first sight the stone of the precipices appears to be sterile or poor in vegetation, but the nearer the margin of the high land is approached the more luxuriant it becomes, the more flowery the open fields, and the more numerous the crystal brooks. Cultivation goes on here, and grain is carefully sown, maize especially. In other parts of the valley a dense dark-green primeval forest reaches close to the precipitous and partly sterile walls of rock. The upper part of the precipices and rocks is, however, bare of any shrub or tree-like vegetation, and looks arid enough during the greater part of the year. Now all this is of great importance to the Baboon. He lives on the top of the rocks in hollows and under ledges of stone, and safely placed there in inaccessible places, he surveys the fertile scene below him, and selects the choicest of the fields for the supply of his food. Probably there would be no such oasis in the country were it not for a very curious plant which really gives the name to the "Black Rocks," and which clothes the hills during the wet season. And if there were no fertile valley the Baboon would certainly not be found in this district. As the wet season progresses, the hills look blacker and blacker, their ruggedness disappears, and even the sterile faces of the precipices grow dark, and the vegetation of the valley appears to crowd up their slope. All this alteration is produced by the vigorous and indeed enormous growth of a singular plant called Scytonema. It retains much moisture within its tangles, and long after the rains have ceased to be felt and to influence the vegetation of the valley, the aridity of the district is antagonised or put off for a while by this interesting property. The Scytonema selects the bare rocks for its favourite locality, and these surround the valley with its teeming vegetation as with a great sponge, whose moisture prolongs the weeks of plant life and of active growth, and adds to a wonderful fertility. With plenty of running water, abundance of food, and a very safe shelter, the Baboons have great cause to thank the Scytonema. They flourish amongst the rocks, and are a terrible scourge to the inhabitants of the valley. Their cunning and boldness are remarkable, and are increased by their numbers. After surveying the growth of the choicest fields of Indian corn they assemble in great troops and destroy entire plantations in a single night.

THE COMMON BABOON.*

There is a Baboon which is much more commonly seen in menageries on the Continent than any other, and which is kept by the Arabian and Egyptian jugglers; yet it is by no means satisfactorily made out whether it is a particular species or only the young or even adult form of some one of those already described. It has a name, however, which ought to leave the identity of the creature in no doubt—it is the Common Baboon, or *Cynocephalus papio*. If it really comes from all the places whence it is said to be derived it lives over a vast district, and is to be found on the west or Guinea Coast inland, in Abyssinia, and on the Nile further north. Sir John Kirk found them in Zambesia in Eastern Equatorial Africa, and was told that the natives held them as sacred, and preserved them, calling them "Nyam" and "Manganja." But probably the specimens from Guinea are those of the Sphinx Baboon, those from Abyssinia are the females of the Hamadryas or of Geladas, and possibly there may be some in this district which really are true Papio Baboons.

They are very common in the half wild and tame condition; and as they often have to take care of themselves in the midst of a very restless and half-starving set of men, their senses become sharpened, and their intelligence becomes exalted in a most curious manner. But nothing is known of them in the wild state.

They are large animals, and their hair is of a uniform yellowish-brown colour, slightly shaded with sandy or light red tints. The whiskers are of a light fawn colour, and the face, ears, and hands are naked and black: the upper eyelids are white and naked, and the tail is about one-half the length

* *Cynocephalus papio.*

of the body, but it has no tuft. They have no mane, and the muzzle is not so prolonged as in the Hamadryas and Chacma Baboons; nevertheless, the cheeks are rather swollen, and in this there is a faint resemblance to the Mandrill, but they are not coloured, and the muzzle is thin beyond them, and as it were truncated. The ears are visible, and are black and hairless, but are somewhat pointed. All the underneath of the body and the under part of the limbs are covered with hairs of a brown colour. Some are of a greenish hue, and the hairs are not of one colour.

Buffon had one that was full grown, and it was as savage as well could be. It exhibited all the ferocity of disposition and intractability of nature common to the rest of its kind when full grown. "It was not," says he, "altogether hideous, and yet it excited horror. It appeared to be continually in a state of savage ferocity, grinding its teeth, perpetually restless, agitated by unprovoked fury. It was obliged to be shut up in an iron cage, of which it shook the bars so powerfully with its hands as to inspire the spectators with apprehension. It was a stout-built animal, whose nervous limbs and compressed form indicated great force and agility; and although the length and thickness of its shaggy coat made it appear to be much larger than it was in reality, it was nevertheless so strong and active that it might have readily resisted the attacks of several unarmed men."

But although thus ferocious in old age, they are amusing, tractable, teachable, and even affectionate when young; they know and like their master, are orderly when with him, can be taught all sorts of tricks, and they even like the young of other animals as pets. There are of course all sorts of stories told about them, some of which are true, for they were told by reliable naturalists from the results of their own experience, but the majority have too much of the wonderful in them, and are clearly the results of Eastern imaginations. A distinguished naturalist and traveller took much pains with some Baboons, and learned much of their habits and curious tricks, and his first pupil was amusing enough. Of course Baboons differ like higher animals in their temper and lightness of disposition; some are grumpy and stupid, and others are as friendly and frolicsome as a genially-disposed Dog. One of these last came into his hands, and was, for a Baboon, quite amiable-looking, full of vivacity, and possessed of a vast amount of animal spirits and talent for the mischievous. He had a place set apart for him near one of the gates of the establishment in Egypt, where he acted as a sort of watch-dog. This duty he performed to perfection, and no one dared to attempt to enter without his leave. To those whom he knew he was polite, but to all others he was quite the reverse. Walking backwards and forwards in great ire when disturbed by anybody unknown to him, he finally stood stiffly on three of his legs, and hammered away at the floor with the knuckles of the other, just as a man raps a table when in a pet. His eyes glared, and he gave tongue in a fierce growling bark.

Sometimes he would put on a most enticing look, and seem most kindly disposed, seeking as it were the friendly notice of people; then out would come his hand for something nice to be given him, and if refused all his good looks departed, and he behaved more like a devil than a watch-dog, rushing at his enemy, and endeavouring to bite and scratch. He was on good terms with all the animals of the neighbourhood, but took a great dislike to some Ostriches which wandered about, and often came close to him, not apparently that they were necessarily unbeloved by Apes, but because they did him some very evil services most unintentionally. He liked to get on a wall under a quantity of straw, which protected him from the sun, and there he dozed away. Now the Ostrich has a very bad habit of trying to swallow or peck at everything; nothing comes amiss so that it can be swallowed: and they one and all are constantly poking here and poking there for most curious titbits. This was the case with the Ostriches in the Baboon's neighbourhood, and it now and then happened that as they were on the search for a novelty they noticed his fine stout tail hanging from the top of the wall. Of course the first Ostrich which was near gave it a good peck with his strong beak, and doubtless a good pull also. This was a most uncalled-for liberty, and not only woke up the sleeper, and hurt him, but also offended his dignity. He awoke full of rage, and before the Ostrich could give a second peck at the gristly morsel the furious Baboon rushed from under the straw, seized his enemy by the neck, and cuffed his head most soundly. He hated Ostriches ever after. The same Baboon was taken on board a boat with the travellers, and exhibited a great fear of the water. After a while he got a little accustomed to it, and gradually was tempted to touch it. He used to go the whole length of his cord, which kept him safe and sound, and, climbing on, would

just let one of his feet touch the glistening surface, and drag through the water. This trick he used to do when he was thirsty, for he sucked the water from off his foot.

He was very fond of young animals, and took upon himself the occupation of nurse, whether the mothers liked it, or the little ones cared for it or not. Thus, on once going through the streets of a town seated on the baggage-wagon, the Baboon was tied fast by a good long cord, which gave him much liberty. He saw by the side of the road a Dog with a litter of puppies, and immediately darted off, caught up one of them, and was returning before the mother had recovered from the shock produced by his audacity. She rushed after him as he retreated with the little puppy clasped to his bosom with one of his arms, and so vigorously did she pursue that the Baboon was placed in difficulty, and had to exercise all his resources to get out of her way with his charge. The wagon was on the

ANUBIS BABOON.

move, and the rope was at its fullest length, when he suddenly took hold of it with the spare hand, and running himself clear, and alighting on his hind legs, met the attack of the furious Dog most bravely. So stoutly did he persist, that the natives rather took his part, and he retained the little Dog. Afterwards his master took it from him, and restored it, to his great disgust; and, indeed, he was extremely offended, and was sulky and out of temper for long afterwards. Doubtless, if some intelligent men, who were accustomed to treat animals properly, would undertake the education of Baboons, they would be successful to a considerable degree; and there is no reason why they should not be as useful to man as the Dog. But they are teased and worried into a premature and senile savageness when in captivity.

One of the plans of teaching a Baboon to like his master is to keep him constantly in the house where he is; the master feeds him, and is kind and never teasing to him, giving him, however, friendly scratches on the back, and having romps with him. Then, when he will answer to some name or call, and has become familiarised with all around, some one comes in with a whip and begins to

talk loudly, and to order the Baboon out of the place. The creature is frightened, and is rather disposed to resist; whereupon the master makes his appearance, and pretends to take his part by opposing the intruder with violent gestures and threats, and making much of the poor brute. This has usually an excellent effect, and produces satisfactory results, the Baboon clinging henceforth to his friend. They are taught to help their masters in conjuring and juggling, and do some tricks well.

COMMON BABOON.

The skull of this Baboon has a face occupying about half of it, and the brain case is much contracted behind and at the sides of the brows, and is flattened behind and above, so that the top of the head and eyes look pressed down. There is a ridge at the back of the skull extending from each ear-bone to a little knot at the back part of the occiput. All the back of the head is marked by the impression of the muscles of the back and neck, and the space for the jaw muscles is large on the side. Underneath, the skull is very long, there is the usual small space for the opening of the nostrils into the throat, and the palate is long and arched. In a specimen in the British Museum there is a little hook of bone on one of the small bones at the base of the skull (internal pterygoid bone), which is seen also in man, and it is for a tendon of a muscle to pass

around, the use of the muscle being to render the soft palate tense. Why this should be so well grown in this Baboon, whose voice is no better than others, is certainly strange. The face is made broad near the eyes by the projecting cheek-bones, and the orbits are broad, not widely open, and they are separated, as in some of the other Baboons, by a part of the forehead bone (frontal), and the upper part of the nose bones (nasals). The nostril opening is very triangular, and on either side is the broad smaller surface of the upper jaw-bone. The front bone of the upper jaw is very projecting. One is struck with the huge chin of the lower jaw, and how slanting and comparatively small are the jowl ends of it. Evidently from the great breadth of the back of the lower jaw, and its roughness for muscular attachments, it is a very strong one, the narrow part in front which holds the teeth being well moved up and down, and side to side, in biting and masticating.

Their hands are rather short, the fingers are black, and the third and fourth are of the same length; they are strong and hold well, the thumb, however, being of no very great assistance.

CHAPTER IX.

THE DOG-SHAPED MONKEYS (*concluded*). THE BABOONS.

The Second Division of the Baboons—THE MANDRILL—Easily Distinguished from the rest—Peculiar Appearance and Colour of the Face—The Cheek-ridges—Noticed by the Ancients—Brutality of its Disposition—"Jerry" at the Surrey Gardens—Their Wild State—Anatomical Peculiarities—The Back-bone and Liver—THE DRILL—Distinguished from the Mandrill—Probable Antiquity of these Baboons—Theories of their Relationship to other Animals—THE BLACK BABOON—Its Locality and Description—Probably a Forest Ape—General Summary of the Dog-shaped Quadrumana and Classification of the Group.

THE MANDRILL.*

THIS large Baboon is the principal one with a very short stump of a tail, and may be distinguished from all others, with and without long tails, by the enormous swellings of its cheeks on each side of its nose, and their odd colouring. In general shape it resembles the rest of the genus, but perhaps its head and chest may be more bulky, and its limbs shorter and stouter than the others, when it has attained its full growth. A full-grown male measures five feet when standing upright, and the colour of the hair is a light olive-brown above and silvery-grey beneath, and the chin is decorated with a small pointed yellow beard. It has a "brutus" in the form of a great tuft of hair on the top of the head, Nature having brushed up the hair off the temples and forehead upwards, in a peak-shaped ridge on the crown, giving a triangular appearance to the whole. The ears are naked and pointed near their tips, and their colour is bluish-black. The muzzle and the lips are large, and as it were swollen and projecting, and the former is not only long, but is surrounded above with an elevated rim or border, and cut short or truncated like that of a Hog. But the most extraordinary features of this ugliest of faces are the projections on each side of the nose. These are formed by swellings of the cheek-bones along the base of the great canine teeth, and the skin covering them is ribbed, and has ridges which are alternately light blue, scarlet, and deep purple in colour, contrasting strangely with the other tints of the hair. To add to the strange look, the eyes are deeply sunken, and their colour, a deep hazel, contrasts with a streak of vermilion, which reaches down each side of the nose to the lip, and extends upwards in the neighbourhood of the brows, which are large and "beetled." A forehead would clearly be out of place in such a brute, and therefore it recedes rapidly above the eyes, and is lost in the great tuft of hair.

The canine teeth are immense, and when the animal is enraged they and the others

* *Cynocephalus mormon.*

are shown, their beautiful white colour contrasting with the strange medley of tints around them. On the body the hair is very bristly, but the hands and feet are naked, and as if to add to the many peculiarities of the Mandrill, they are small in relation to the vigorous-looking limbs and short chest.

So curiously decor ted a brute living just outside the civilisation of the Egyptians, Greeks, and Romans, was sure to attract notice, especially as they were brought into Europe by the African merchants. Aristotle appears to have been struck with the hog-like look of the head, and he called it by the name of Hog-Ape (*Cæropithecus*), and all writers, from the earliest to the latest, have contributed opinions founded on very doubtful facts, to the detriment of its character. All the iniquities, abominations, and scandals that have been coupled with the Gorilla, Chimpanzee, and Orang-utan, are linked on fourfold to the character of the ill-favoured Mandrill, and this is decided to be quite correct by the natives of the Gold Coast and the inland regions, where it lives a most dreaded and independent life.

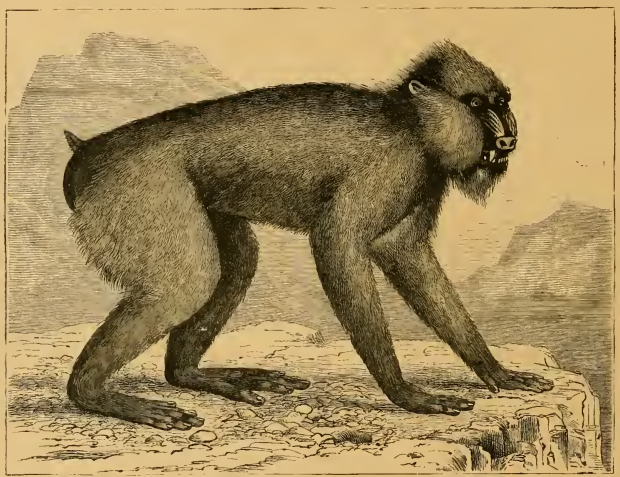
There is no doubt that the Mandrill is extremely brutal in its adult age, and that the males are ferocious and disgusting, there being no particular choice as regards ugliness and oddity of decoration between their faces and sterns, whose callosities are vast. But the young are not so, and probably the quieter tints of the female are associated with a gentler disposition. Both the young and the females have shorter muzzles than the adult males, and they have neither the great cheek-swellings nor the colouring of the face; in fact, it is only when the great eye teeth are being cut by the males, as evidences of its age and powers, that the irregular decoration begins to be noticed.

The question of the colouring and ornamentation of Monkeys will again be noticed in the summary at the close of the description of the Quadrumana, and it is therefore only now necessary to remark that the most grotesque-looking and ferocious Mandrill is especially beautiful in the eyes of his partner, who, with humble colours and softened looks, admires her fractious spouse. His colours glow with love and flame under the influence of passion, and probably no more curious-looking piece of living polychrome was ever seen than "Jerry," at the Surrey Zoological Gardens, when he got in a rage after drinking gin and water. "Jerry" was old and had gained all his ornaments, but had lost his levity, fur, and amiability. Broderip writes of him: "He liked the good things of Mandrill life, but would not put up with its troubles. He was a glutton, and ferocious in the extreme. Most kindly he would receive your nuts, and at the same time, if possible, would scratch or pinch your fingers, and then snarl and grunt in senseless anger. He would sit in a little arm-chair, and would wrap himself up in a blanket, knowing what was coming, the bribe being either a cup of tea, which he took, as people used to say, 'quite like any Christian,' or, what was much nicer in his eyes, a glass of weak grog and a pipe. If he was disturbed in his enjoyment he was not pleasant, and if a shower of nuts came in upon his feast, especially if it occurred after the gin and water, he came out in his true colours. Cramming the nuts into his mouth, and stowing them away rapidly in his cheek-pouches, thus giving an unusual size to his jaws, he would howl and march about, snarling and grunting. His little eyes glared, his nose and cheeks became swollen, and their colours most vivid. His hair stood out, and he walked as it were on the very tips of his fingers and toes, presenting every now and then vermilion behind, which a distinguished French anatomist has said was not without elegance."

He was under the control of the keeper, who had, however, to take care that he was not bitten unawares, for "Jerry" was deceitful and treacherous in the extreme. It is said that he once dined in the presence of royalty, and that he was one of the many higher animals who were invited to dine by George the Fourth at Windsor when his Majesty required novel amusements and unusual excitement. Doubtless he behaved himself, and contributed as much, and probably more, than any guest, to the royal enjoyment, and he appears to have enjoyed his hashed venison himself. There was no mistake about his enjoying his pipe, for he smoked as slowly and sedately as the gravest of his visitors at the Zoological Gardens.

Had "Jerry" been let alone, and had he remained in Africa at liberty, doubtless he would have in time headed his troops as patriarch and watchman, and would have led them in many an expedition against the fields of corn and the plantations of fruit-trees. For the Mandrills, in a state of nature, behave much like the other Baboons. They are, however, very fond of insects, large and small,

inoffensive and venomous, and they lift up stone after stone in their search for them, enjoying Scorpions as much as anything else. Probably they can throw a stone, and this, coupled with their aspect, their assembling in troops to defy the farmers and watchers, and their attacking Dogs without mercy, has given them the bad character in the eyes of the negro race which they appear to have had from time immemorial. It is said that they annoy the Elephants so much that they will not remain in the same district; but it is doubtful whether the great proboscidean could flourish where the Mandrill cares most to live, for he is neither a forest nor a plain Ape, but, like the rest of the Baboons, travels far and wide from his rocky home. They associate in bands like the other Cynocephali, and behave as they do when plundering; but it appears to be true that the Mandrills are often found in small numbers, and that then they devote themselves to hunting for insects rather than to predatory excursions. Very little is



MANDRILL.

known about their habits in the wild state in Africa, and it is evident that they are avoided rather than watched by the Blacks.

Although, from the scantiness of reliable information regarding their habits when living at liberty, the Mandrill is of no great interest to the ordinary naturalist, still, the comparative anatomist, having had the advantage of dissecting both tame and wild specimens, considers this Monkey, which is ordinarily placed last in the scheme of the classification of the Old World kinds, of very great interest. For, placed low down in the Monkey scale, and remote from the man-like Apes, it approaches the flesh-eating animals, or Carnivora, in many points of its construction, and, if not exactly, still approximately, and in their general character.

The back-bone, for instance, although its curves recall those of man, is eminently that of the brute, that is to say, it greatly resembles that of many kinds of quadrupeds. The pieces, or vertebræ, of the back (dorsal) have, of course, spines, but they do not slope backwards; on the contrary, those of the last three are directed forward; and the loin, or lumbar vertebræ, are six or seven in number,

and there is an arrangement by which their general strength is increased, by a forking of the joint-bearing processes which unite them together by the formation of a bony structure. These peculiarities connect the Mandrill, whose common position is on all-fours, with the inferior quadrupeds, for they exist in them. Then there is no true sacrum bone, but two or three back pieces (sacral vertebræ), form a short conical sacrum—one attached separately to the hip-bone on either side. This is like the arrangement in the Carnivora. The hip-bones are long, narrow, and deeply excavated behind, or rather externally; the front of the bony girdle of the loins (the pelvis) is long; and the bones (the ischial) on which the Mandrill sits are very broad and semicircular. Now, these three apparently simple matters of anatomical detail are not only of interest to those who recognise the analogies of the same parts in different animals, for they relate to means, to ends, and commend themselves to the

YOUNG MANDRILL. (*From a Sketch at the Zoological Gardens.*)

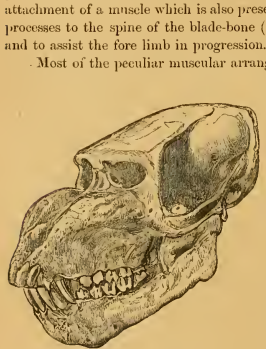
consideration of ordinary observers. The shape of the hip-bone on each side, so unlike that of man and the man-like Apes, perhaps the Gibbons excepted, depends upon the relation of the muscles which move the hind-quarters and their bones, and the hollow in the hip is well filled up by those which pass backwards to the thigh. The position of those muscles assists the motion of running on all-fours and of springing. The length of the girdle (the front of the pelvis or pubic bones) relates to the dimensions of the digestive and reproductive organs. The large size of the haunch-bones, or rather of their ends, is due to their being covered by the great pad-like hard parts, or callosities, on which the creature sits very constantly. Instead of having the soft muscles so familiar to the human anatomist well and largely developed there, it has this mass of fat cellular tissue and coloured skin attached to a curved bone, the whole being a most comfortable seat, and very frequently used by this restless Monkey. The bones of the tail are few in number, for it is short, but the muscles which wag the organ in Monkeys, in which it is of some size, are still present at its root. There is a capacious chest in the Mandrill, but its bones, or rather the ribs which partly form it, are, as it were, pressed in at the sides, so that it is not round like that of the higher Apes, but rather long and flat at the sides, and thus resembles the

chest of the Semnopitheci on the one hand, and that of the lower four-footed animals on the other. It has good lungs and a strong heart, and the intestines, stomach, and liver do not occupy as much space relatively as in the genera of Monkeys already described.

There is a singular approach in the conformation of the fore hand to the paw of the Carnivora, and a great departure, so far as resemblance is concerned, from that of man in the Mandrill. It is produced by the relative length of the bones which unite those of the wrist to those of the fingers, for these so-called metacarpal bones, four in number, leaving out that of the thumb, are of the same length, and not unequal, as in the higher Apes and in man. Therefore, the middle finger of the Mandrill is not longer than the others, and hence the peculiarity of the hand as a whole. This is noticed in some Macaques to a certain extent.

There is one anatomical peculiarity of the body which may also be noticed, as it relates to the movements of the animals, and their trotting and galloping on all-fours. The pieces of the back-bone in the neck have processes which project outwards (transverse processes), and in the Mandrill they have a triangular shape, and a ridge exists upon them, which is the representative of a very distinct piece of bone in most of the other Mammalia. Now, this structure appears to have to do with the attachment of a muscle which is also present in the Macaques, and which reaches from these transverse processes to the spine of the blade-bone (scapula), and its duty is probably to draw this bone forward, and to assist the fore limb in progression.*

Most of the peculiar muscular arrangements of the Cynomorpha previously described are repeated in the Mandrill; but it has some which are of much interest. Thus, the great chest muscle (pectoralis major), which reaches in the higher Apes from the front of the chest to the upper arm-bone, is very large in the Mandrill, and is divided into three portions, and the great air sac of the neck projects between them. There are also muscular fibres connected with the back, which assist the animal in pulling back its upper arm, and they give force not only to blows, scratchings, and tearings, but also velocity to the movements of the whole limb in moving along the ground. Strangely enough, there is a curious resemblance between the muscles of the thumb of the Mandrill and of the Orang-utan, two of them being united together, so as to give the thumb seven instead of eight; the tendons of these muscles (the long adductor and the short extensor) remain, however, separate. This is a part of the anatomy which recalls the corresponding structures in the Carnivora, and indicates the restricted amount of movement in the thumb of the lower Apes and Monkeys.



SKULL OF THE MANDRILL.

Having a good digestion, the Mandrill has a tolerably large liver, but it is separated into several lobes, or pieces, which are more in number than those of the other genera; but as it is partly insectivorous in its diet, there is no necessity for a very full-sized large intestine, and this is not furnished with the appendix noticed in the man-shaped Apes.

Finally, as regards the skull, it may be said, that that of a large adult Mandrill is the strongest created; so huge are the jaws, face, teeth, and crest-ridges, that one wonders where its brain can be put in life. The true brain-case is indeed small, and is encroached upon inside by the back of the orbits, whence the eye looks out under the "beetle-brows."

The forehead bone is triangular-looking, and there is no ascending of the forehead, the bone being, as it were, crushed flat, so as to make a triangular space with the brows in front. Ridges exist on the sides of this space, and pass backwards to the occiput, where they meet side crests from the ear-bones. The occiput is stuck up in a singular manner, and the surface of the bone is strongly marked by the muscles which draw the head backwards. Of course the singular part of the skull is the huge ribbed prominence of the upper jaw-bone on the side of the nose, and the great upper canine teeth.

* The *Acromio-trachelian*. It does not exist in the Chimpanzees.

THE DRILL.*

Very little is known about the habits of another Baboon which is found on the coast of Guinea, and which is called the Drill. But it has been described, drawn, and stuffed frequently, and has been called Wood Baboon, the Cinereous Baboon, and the Yellow Baboon. The natives evidently confound it with the young Mandrill; and as it is good-tempered when young they capture specimens for European menageries, where they are commonly to be seen. It appears to be a modified Mandrill, like it in temper, and in its disagreeable adult qualities; it has not, however, the grand coloration of the face, although the prominences of the cheek-bones are present.

The Drill is smaller than the Mandrill, and has a short stumpy tail, occasionally two inches in length, covered with bristly hair, and ending in a brush. The colour of the hair is greener than that of the Mandrill, and underneath it is whiter and more silvery, whilst there is much light-brown hair on the upper parts of the limbs. It has whiskers, which are brushed back, and a small orange-coloured beard; moreover, the general tint of the skin beneath the hair is dark-blue, and the dinginess is relieved by scarlet callosities.

The Baboons of Africa certainly lead very exceptional lives for Monkeys. They are the Apes of the rock and plain, and they would be out of place, on account of their method of moving and their general habits, in the dense tropical forests and swampy jungle. Their structure and general conformation are especially suited for their mode of life, and their courage, numbers, and instincts avail them against their common enemies—enemies which the contented dwellers in the woods, such as the Troglodytes, have not. Probably the Baboons are of vast antiquity, for the age of the African hills is great, even geologically speaking. The tree disappears and the woods die away sooner or later, whilst the rock merely crumbles. Certainly the life of the Gorilla and other great Apes is intimately associated and connected with the life of the great trees and the duration of the vast woods of Equatorial Africa. Destroy them, and the days of the Troglodytes would be at an end. But the rocks and hills are not so transient as the woods, and the Baboon will exist long after the higher Apes are extinct. Did he exist before them, and is he the link between them and a still less monkey-like animal? These are questions whose import has not escaped the active mind of one of the most eminent of anatomists, for Gratiolet believes in the descent of the Gorilla from the Baboon, and of course that the last preceded the first in time.

The possibility of the descent of the Cynocephali from a flesh-eater only rests upon the resemblance of some of the structures of the Mandrill, for instance, to those of some of the Carnivora. The dog-like appearance of the Baboon of course depends upon its long snout and jaws, but these are very different in their anatomy and construction from those of the Dog. The Cynocephali (Baboons) are the lowest of the Old World Monkeys, but their next-of-kin in the downward classification are not now existing. They are more remote from the Lemurs, which come next below as Quadrumana, than they are from the great Apes.

Hence the Baboon stands very much by himself. He may have possibly very distant relationship with some long-lost forms—creatures which lived geological ages since, and in which the ferocity of the Carnivora was combined with some of the structures of the Monkey; or—and this is the more probable—he may have once lived as a denizen of the forest, and the symbol of Thoth may really have merited the name of Hamadryas. The forest may have succumbed to changes in the physical geography, and the survivors of the slow extinction of the trees had to lead different lives and assume other habits. The Cercopitheci (the Guenons) may have been the old forest Monkeys, and the Macaques, those half Baboons, may be their modified descendants in a line which led to the true Baboon. If this be true, the dog-like characters of the Cynocephali were given by nature during their progressive alterations from the condition of Tree Monkeys.

THE BLACK BABOON.†

There is a small Baboon which is very interesting to the student of the distribution of animals over the surface of the globe and to geologists. It is jet-black in colour, there being hardly a trace of dark-brown in its long hair, and hence it has been called the Black Baboon, or *Cynocephalus niger*.

* *Cynocephalus leucophæus.* † *Cynocephalus niger.*

These animals are found in considerable numbers in the great island of Celebes, situated in the sea between Australia and the mainland of Asia, and they have been introduced by man into the Philippine Islands and Batchian. They are, therefore, extra-African, but they are true short-tailed Baboons, nevertheless.

The Black Baboon, when full grown, is about two feet in length, and the tail measures about an inch. Its face and neck are not covered, but all the rest of the body, the head, and the limbs, have a long black fur, and the hair of the top of the head runs up into a tall long half-curl. The face is long and very melancholy-looking, and the cheeks are smaller, but coloured black on either side of the nose. But the nose does not extend, like that of a Dog, quite to the end of the muzzle, for the creature has a decided upper lip, and the division or septum of the nostrils is long and rather broad, so that these openings look downwards and outwards. The seat has a scarlet tint, and the tail is a mere knob.

DRILL.

Nothing is known about the wild habits of the Black Baboon, but it appears to be a wood Ape, and it certainly has not the impudence or the bold aggravating courage of the African Baboon in confinement. They are frequently brought over to Europe, and may be watched in most zoological gardens. They are capital climbers, but they like to remain a great deal on the ground, sitting upright on their haunches in a very sedate manner. Associating very well with other Monkeys, they appear rather affectionate in disposition than otherwise, and may be seen looking very quiet and stately whilst some more agile companion rubs his face and lips against theirs, apparently to their gratification. The distinction between the Black Baboon and the African kinds is slight, and they all belong to the same genus,* and therefore must have had a common parent in remote times. But the black one lives far away in the Asiatic islands, surrounded by animals different from those which live in Africa, many of which, nevertheless, have a curious African look about them. Now, the geologist asserts that there are proofs of the former connection by land of the mainland of Asia, Hindostan, and

* Some zoologists make a new genus (*Cynopithecus*) of the Black Asiatic Baboons. We demur.

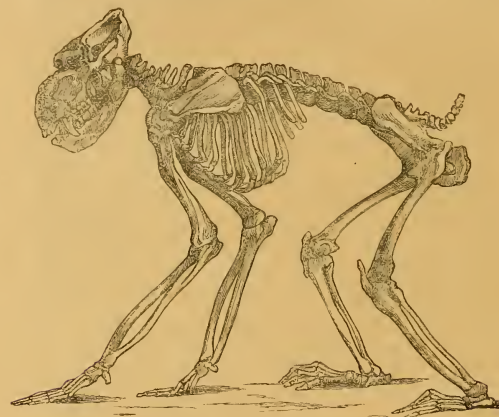
Africa. The facts upon which this assertion is made will be stated in several consecutive chapters of this work, and indeed particular allusions to them from time to time will be inevitable. It is only necessary to mention here that the separation of the two great masses of land occurred about the time of the elevation of the Himalayas as a mountain chain, and they are about as old as the Alps of Europe. Hence the Baboons, found as they are in the separated districts, existed as a united genus before those vast changes. If the Black Baboon is a forest dweller—and there appears to be good reason

BLACK BABOON.

to believe that this is the case—there is something more than simple conjecture in the suggestion that the whole of the Baboons once lived in forest lands.

The Cynomorpha, or Dog-shaped Quadrumana, include the genera Semnopithecus, Colobos, Macacus, and Cynocephalus, and their distinctions and some of their anatomical peculiarities have been noticed, and they may be summarised as follows:—As a group, the Cynomorpha are more fitted for running on all-fours than for any other method of progression, and their construction relates to that of such running animals as the Cats as well as to that of the Monkeys. Thus the arm-bone (humerus) is unlike that of the man-shaped Apes; it is bent so as to be slightly convex forwards, and the top where the round joint is—the head of the bone—looks upwards and back-

wards, and not upwards and inwards as it does in the Gorilla. The forearm bones, longer than the arm-bone, are modified, and the most movable of them (the radius) is so much jointed to the arm-bone that the power of moving the lower part of the forearm upwards and downwards (of pronation and supination) is much diminished. There is the extra bone in the wrist, making nine, and one of the bones sticks out behind (pisiform), so as to form a kind of heel to the hand. The thumb is complete except in the Colobi, but it is short in proportion to the other fingers; and in some the third and fourth fingers are equal in length, thus departing from the Ape, whose third finger is always longest, resembling rather that of beasts of prey. The blade-bone differs much from that of the Anthropomorpha, being longer and narrower, and the portion above its spine, instead of being large, as it is in such ponderous climbers, is small. All these arrangements relate to



SKELETON OF THE MANDRILL. (From the *Cyclopædia of Anatomy and Physiology*.)

the running on all-fours, the palms of the hands being applied to the ground. Moreover, in order that the hand should thus resemble a foot in its duties, some of its muscles simulate those of the foot and fore-leg. Thus a muscle which extends the metacarpal bone of the thumb (the bone between the wrist and the thumb under "the ball"), and keeps the thumb flat on the ground in running, and tends to pull it up, has a slip which is attached to the bone of the wrist, called trapezium, and which is at the wrist end of the metacarpal bone. It extends the wrist as well as the thumb. Now this is an arrangement seen in the foot, where a muscle extends the great toe's metacarpal bone and the ankle bones also. In order to carry out this extension of the fingers, so as to prevent downward bending (or flexing), they have a complete double set of extensor muscles.

All the Cynomorpha have the lifting muscle of the blade-bone; and the muscle which pulls the elbow back and assists in climbing, both in the Gorilla and its fellows, is present (the slip from the back to the elbow, *Dorso-epitrochlearis*).

The nature of the spine and back-bone processes has been noticed in the Mandrill, but it is necessary to state that the hip- and haunch-bones are not closed in behind by a distinct sacrum, as is the case in the Anthropomorpha. The arrangement in the Cynomorpha closely resembles that of the great beasts of prey, but the haunch-bones are turned out slightly so as to form a seat. There is considerable variation in the number of the bones in the back and tail. With regard to the hinder

limbs, the thigh-bone has a round ligament at its joint with the pelvis, and the shaft bends forwards, and when the animal is at rest on all-fours the thigh projects forwards and downwards, thus indicating the almost permanent position of this great bone in most runners on all-fours, the Elephant being a remarkable exception. The heel-bone is flat from side to side, and the toe-thumb, which reaches about half way up the first joint of the next toe, has considerable powers of motion, and can be struck out from the foot or be pulled in. The climbing muscle exists (page 106), as does also the peculiar stretching muscle of the little toe (abductor of the metacarpal bone). A transversus pedis, already noticed, exists. As the fore-limb assists greatly in locomotion, and much climbing is done by it, the "calf" is not much required for the hind limbs; and one of the muscles of it (the soleus) has a comparatively small surface of origin—from the fibula alone. The great muscle of the back of the thigh, which assists in the perfect erect posture and in the running also in man, is incomplete in the Cynomorpha. Its fibres reach from the haunch-bone to the small bone of the fore-leg in these last, but in man they arise also all down the back of the thigh, and enable the knee-joint to be kept straight. All these Monkeys have a muscle on the sole of the foot called the plantaris, but it is not seen in animals lower in the scale than the Quadrumana; moreover, all the other muscles of the sole are more isolated than in man, and consequently they produce more distinct and separate movements of the toes, and especially in the toe-thumb. The tail, so variable in its development, consists of numerous bones, which are modified "back-bones," or vertebræ, and in some there are little bones which are under these, and arranged in a rude V-shape, their office being to protect the blood-vessels which are enclosed by them. The muscles and nerves of this tail are special, and contribute to its different movements. The huge canine teeth and the cutting first pre-molars have been noticed, and it only remains to observe that the Cynomorpha have a first set of teeth (milk teeth) which fall out gradually, and are replaced by the permanent ones. The milk teeth consist of four incisors above and below, two pre-molars above and below, and four true molars above and below, making twenty teeth in all. All these animals, except the first two genera, have simple stomachs, but the liver has several fissures in it in the Baboons (as it has in the Gorilla), and but few in the Asiatic species (as in the Orangs)—facts of no small significance, for it is very probable that the Gorilla is one of the Baboon line, as the Orang is one of the genealogical tree of a Semnopithecus. The brain exhibits all the convolutions seen in the Anthropomorpha, but the very monkeyish external perpendicular one is well marked. The little brain is not uncovered by the brain proper, which is shortest in the Sacred Apes and longest in the Baboons.

The description of the Cynocephali ends that of the Monkeys of the Old World—The Catarrhini—and the whole of the group may be classified as follows:—

Class.—Mammalia.
Order.—Primates.
Family.—Catarrhini.
Sub-Family.— { 1. Anthropomorpha. 2. Cynomorpha.

1. Anthropomorpha.

Genus—Troglodytes.	Example—The Gorilla and Chimpanzee.
,, Simia.	,, The Orang-utan.
,, Hylobates.	,, The Gibbons.*

2. Cynomorpha.

Genus—Semnopithecus.	Example—The Entellus Monkey.
,, Colobos.†	,, The Guereza.
,, Cercopithecus.	,, The Guenons and Mangabeys.‡
,, Macacus.	,, The Magot.
,, Cynocephalus.	,, The Baboons.§

* The Siamang is included in this genus.

† This spelling is preferable to "Colobus."

‡ Some zoologists separate the Talapoin Monkey, and place it in a genus by itself; and the Mangabeys are sometimes included in a genus Cercocebus.

§ The Gelada is included by some in a genus Theropithecus, from its nostrils opening high up; and the Black Baboon is placed in a genus Cynopithecus. These are all inadvisable complications.

CHAPTER X.

THE MONKEYS OF THE NEW WORLD.*

THE CEBIDÆ—THE HOWLERS—THE WOOLLY MONKEYS—THE SPIDER MONKEYS—THE SAJOUS.

The Monkeys of the New World—How Distinguished from those of the Old—Their Division into Families—The First Family, THE CEBIDÆ, with Prehensile Tails—THE HOWLERS—Appropriateness of their Name—Where Found—General Description—THE YELLOW-TAILED HOWLER—Anatomical Peculiarities and Appearance of the Face—Other Members of the Family—THE BLACK HOWLER—Its Locality—THE WOOLLY MONKEYS—THE CAPARRO AND BARRIGUDO—First noticed by Humboldt—Peculiarities of the Skeleton—THE SPIDER MONKEYS—Seen by Humboldt in the Brazilian Forests—Remarkable Power of the Tail—Flexibility of the Limbs—Conformation of the Brain—Other Species—THE COAITA—Curious Stories of them in Captivity—THE CHAMECK—THE BLACK SPIDER MONKEY—Its Geographical Range—Its Position in Sleep—THE VARIEGATED SPIDER MONKEY—THE SAJOUS—THE CAIARÁRA—Observed by Bates on the Amazon—Other Varieties—THE BROWN SAJOU—THE CAPUCHIN SAJOU—Described by Brehm—Their Remarkable Dexterity and Cleverness—Diseases of Monkeys.

NOT one of the numerous kinds of Monkeys which have been noticed in the former chapters has ever been found in the New World—that is to say, on the American continent. The converse is also true, for not one of those which are about to be noticed, and which inhabit the tropical parts of South and Central America, has been seen in any other part of the world.

The two groups are not only distinct as regards their geographical distribution, but they are also different in many very important points of their construction and habits. It is evident that, although it may be said that the resemblances between the Baboons, Macaques, and Troglodytes, for instance, indicate some kind of relationship, and suggest a community of origin, there is nothing of the sort to be traced between any Old and New World Monkeys. They seem to have started from different sources.

All the Monkeys of the New World have the partition between the nostrils broad, and it separates them widely: they open as it were sideways, and the whole of the lower part of the nose is flat. This peculiarity has given the name to the group, as has been explained in the first chapter, and it is accompanied by some others. Thus, with one exception, the numerous genera of the New World Monkeys have the hinder limbs the longest, and they are wont to go on all-fours, the erect posture being only occasionally adopted by the Spider Monkeys. Their thumbs differ less from the other fingers than do those of the Old World Monkeys, and the toe-thumb is large and movable; no cheek-pouches or callosities are seen in any of them, and only a few have air sacs. It is usual to say that the American Monkeys are known by their prehensile tails, but this is only true in part, for whilst some have this member wonderfully developed and useful, others have it incapable of holding on, whilst a few have barely a tail at all. The teeth are more numerous than in the Apes and Monkeys of the Old World, in one set of New World genera; and they are of the same number in another. In the first instance, there are thirty-six teeth instead of the thirty-two so frequently noticed hitherto, and in the last the thirty-two are differently arranged to those possessed by the Old World kinds. For example, in the prehensile-tailed Howlers, there are thirty-six teeth, or one extra tooth in each jaw and on both sides, over and above the usual thirty-two; and this tooth is a false molar, or one of those between the true grinders and the canine teeth. There are thus three false molars instead of two, as in the Old World kinds, on each side in both jaws.

In the Marmosets, which have only thirty-two teeth, there are only two back grinders in each jaw on each side instead of three, as in the Old World Monkeys, but there are three pre-molars in each jaw on each side. All these distinctions are useful in the classification of these American Monkeys, and therefore they have been divided into two families, one having thirty-six and the other thirty-two teeth, and the first family has again been subdivided into the genera with prehensile tails and those without them. The first to be described are the Cebidæ, and this family contains—first, the genera with thirty-six teeth and with prehensile tails; second, the genera without prehensile tails and the same number of teeth.

* *Platyrrhini.*

GROUP OF HOWLERS.

THE HOWLERS.*

Although articulate speech is denied to the Monkey world, many have very extraordinary voices, the capacity for making a noise being great in them. Thus, the Gorilla has a tremendous voice, and the Gibbons are especially noisy, one of them having been noticed (page 77) to be able to emit something like a series of musical notes. But they are all silent in comparison with the noisiest of all Monkeys—the South American Howlers. The females of this group can make a moderate amount of disturbance, but the males surpass every animal in their prolonged and sustained yelling. Their howlings, commencing often suddenly at the close of day or in the middle of the night, amongst the strange stillness of the great virgin forests, appal the traveller on his first visit. "Nothing," says Waterton, speaking of the Red Howler, "can sound more dreadful than its nocturnal howlings. While lying in your hammock in those gloomy and unmeasurable wilds you hear him howling at intervals from eleven o'clock at night till daybreak. You would suppose that half the wild beasts of the forest were collecting for the work of carnage. Now it is the tremendous roar of the Jaguar as he springs on his prey; now it changes to his deep-toned growlings as he is pressed on all sides by superior force; and now you hear his last dying moan beneath a mortal wound." Humboldt and Bonpland landed at Cumana, and travelled towards the celebrated cavern of Guacharo, and they saw and heard the Howlers often; and on getting into a cold district their horrible din became worse, and was heard at a distance of two miles. This was near the convent of Caripé, which is more than 4,000 toises (a toise being rather more than our English fathom) above the sea, and where the nights are cold. The animal clearly has earned its appellation of the Howler, and might properly have been called Stentor, as was proposed by a distinguished French zoologist. Stentor was a Greek, whose voice was louder than that of fifty men. But Illiger, probably familiar with the writings of the learned Apuleius—that student of Carthage and Athens who married a rich Roman widow, and was therefore accused of witchcraft, and who wrote the "Golden Ass," a book singularly applicable to modern society—called the Howler after the word *Mycetias*, an earthquake with a hollow bellowing noise. The word is from μύζω (to moan). An old writer (Margrave) wrote in his Natural History of Brazil, in 1648, that all the Howlers assembled in the morning and evening in the woods, and that one takes his place on a tree high up, and motions to his companions to sit down and listen, and then, after having seen them all seated, commences his discourse, pitched at so high a key that at a distance one would imagine that all the congregation were joining in. But this is not the case; only one orator is allowed to speak at a time, and all the rest wait politely, but not very patiently. When he has had enough howling he motions to the whole, who burst out into a fine chorus for some time. Then, by order, they all cease, and the first recommences, and after having been listened to with due attention the whole depart. What the noise must be sometimes, if they all join in, may be gleaned from the fact that Humboldt saw the trees crammed with them, and believed that more than 2,000 may be found in a square league.

It really does occur that when there is an assemblage of these Monkeys—for instance, of the *Mycetes Caraya*—when the weather is warm and open, they make the forests resound in the morning and evening with their overwhelming voices. The males begin the dreadful concert, in which the females, with their less powerful voices, sometimes join, and which is often continued for several hours. It does not appear that any especial cause induces them to begin their noise, and probably they do it because it pleases them, as the birds do in their prolonged songs. Mr. Darwin suggests very forcibly that the females are pleased or attracted by it, liking (as in higher animals) the loudest and most intolerable of the noise-makers best. Hence one Howler is, of course, always trying to outdo the others. But it is true that some Howlers live in pairs and indulge in their vocation all the same. Wallace, however, states that the females do not join in the noise, and that the howling is made before bad weather, and in the evening.

These Howlers are the largest of the Monkeys of the New World, some being nearly three feet in length, without counting the long prehensile tail; they have movable thumbs on their hands, a hairless space underneath the tip of the wonderful tail, and the howling apparatus in the throat.

* *Mycetes.*

They have rather tall heads, with beard and large lower jaws, which, with a thickness about the throat, give the appearance of an unusual swelling being there, the cause of which will be noticed further on. Some have long and others short fur, but generally there is much of it about the head (where it is brushed forwards) and neck. Black and red are favourite colours, and the young of both sexes differ often in their tints from the adults, and so do the males from the females. One kind in particular is decidedly coloured.

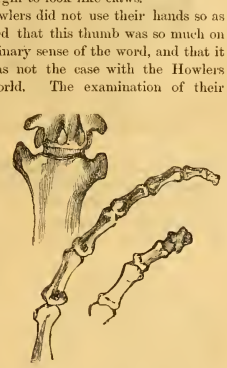
THE YELLOW-TAILED HOWLER.*

The last half of the tail of this species is of a brilliant golden-fawn colour, and this tint is on the upper parts of the body nearly up to the shoulders; the rest of the tail is light maroon, and what remains of the body is dark maroon, there being a violet tint in the limbs.

Besides its colours this kind presents some points of interest. They live in companies, and when they pass from one tree to another they all play at follow-my-leader exactly. They watch the movements of those which precede them, jump in the same manner, and at the same place, and even place their feet and hands on the same spots on the boughs. They are found in Columbia and New Granada, and in Brazil on the confines of Paraguay.

The limbs of all the Mycetes are long, and whilst there is a good toe-thumb to the foot, the very best of the hand-thumbs is not equal to those of the Monkeys of the Old World. The nails on the fingers and toes are compressed from side to side, as it were, and begin to look like claws.

Ogilby, an admirable observer, noticed years ago that two Howlers did not use their hands so as to take things between the thumb and forefinger, and he ascertained that this thumb was so much on a line with the other fingers that it was not opposable in the ordinary sense of the word, and that it was more like an extra finger than a thumb. This, he noticed, was not the case with the Howlers alone, but that it peculiarised the Monkeys of the New World. The examination of their skeletons shows that the bones of the thumb are on the same plane or level as the fingers, and the whole is brought close to the fingers, as our great toe is to the other toes. Nevertheless, this thumb can move to and from the fingers.



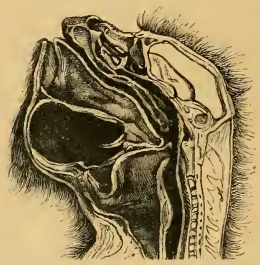
BONES OF THE TAIL OF THE HOWLER.

But if the fore-hand so greatly resembles a paw, compensation is made to the animal by the gift of the prehensile tail, which is very muscular, and the under surface is without hair near the end, so that the sensitive surface can touch and feel objects. They can feel, therefore, around them, and also above them, as they move along and lay hold of branches and hanging creepers without looking for them. The delicate sense of feeling depends on the nervous supply; and the power of clasping and holding on upon the bending or flexor muscles. A bony framework supports all these structures, and runs from the last bone of the sacrum to the tip, and consists of many separate vertebral bones placed in a long series. The first few bones which join on to the sacrum, and form the root of the tail, resemble the back-bone pieces, or vertebræ, to a certain extent. Each has a body, and also processes for jointing with the one before and behind, and a spine also. Besides these, there are two curious projections on the lower part of each body, which are called chevron bones, and are V-shaped, and their use is to allow the blood-vessels and nerves to pass along between them without being pressed upon. Towards the end of the tail the vertebræ become long and stout, and are united behind and in front, forming a broad bone, and without the joints, and the chevron bones are reduced to little rounded pieces of bone. Everything tends in this tail to ready, rapid, and forcible motion, and indeed so perfect an organ is it that when one of these Howlers is shot it always hangs to the tree by its tail, even if quite dead, and does not fall down until some hours afterwards, when the strong flexor muscles have relaxed.

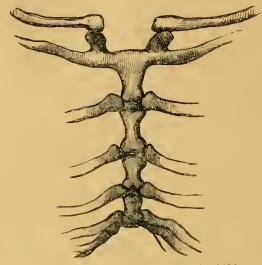
* *Mycetes chrysurn.*

Therefore, writes a recent author, if fresh food is required, it is best to kill a Lagothrix (see page 171) in the Peruvian valleys, as hung meat soon becomes tainted. The Golden Howler, nevertheless, furnishes the principal animal food to the inhabitants of the banks of some of the rivers entering the Peruvian Amazon. They keep to the low lands and shores of the rivers, and are found moving from place to place in pairs.

The head of this and all other Howlers has a large black face, and a high receding forehead; the chin recedes much, and there is a great jowl produced by the large bones of the lower jaw. There is a curious swelling at the back of the orbit; and the part of that cavity for the eye which joins the cheek-bone has a round hole in it, as if it had been made by a gimlet. It has two nose or nasal bones, which

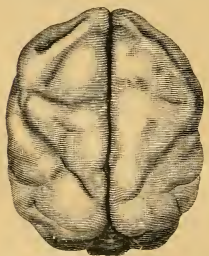


SECTION OF HEAD AND OF AIR SAC OF THE HOWLER.
(From the *Cyclopædia of Anatomy and Physiology.*)



UPPER PART OF BREAST-BONE AND COLLAR-BONES OF THE HOWLER.

remain separate, and the forehead (frontal) bone goes so far back that it joins the side (parietal) bones of the skull in a V-shaped suture, or union, and there is not much back to the brain-case, which is depressed in shape, on the whole. They are vegetarians, and yet have very decided canine teeth, those of the upper jaw being large, and they project downwards much lower than the other teeth; and the large lower jaw has evidently quite as much to do with the howling apparatus as with the teeth, for it opens out behind to admit of the great bone of the tongue moving readily within its boundaries.



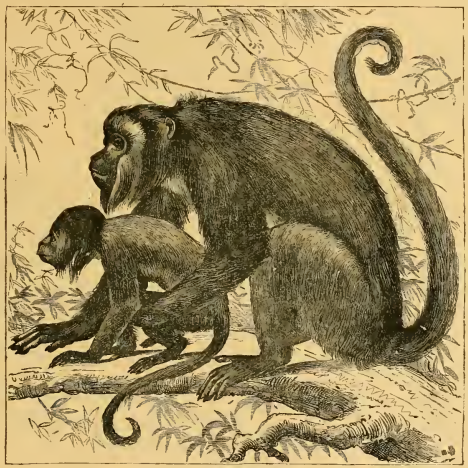
BRAIN OF THE HOWLER.

This Howler, like all the others, has good lungs, and a windpipe ending, as usual, in the larynx and its thyroid cartilage (see page 22), as in other Monkeys. The bone at the base of the tongue (the hyoid) is attached to this cartilage, as usual, by a membrane, and instead of being a flat curved bone with two projections on each side, called horns, is swollen out into a bag shape, the horns being very small. The bone in other animals is at the base of the tongue, and this is the case in the present instance, although it is so large, the inside of the hollow being able to contain four cubic inches of water. Now, the air from the upper part of the windpipe can get into this cavity, as there is an opening between it and the upper part of the larynx. Hence the same noise is produced as if the animal howled into a resonant shell.

In order to strengthen the voice, the cartilage of the larynx itself is large and strong, and the so-called ventricles of it are enlarged into air sacs, and they unite in front of the "Adam's apple." Besides these there are other sacs connected with the gullet. So that the whole of the front and sides of the neck below and between the sides of the lower jaw are

complicated by air sacs and resounding chambers. The breast-bone of the Howler differs in certain respects from that of all other Monkeys, for its upper bone (manubrium) is halved, and each half supports the end of the collar-bone and first rib. Possibly the resulting space may have something to do with the air sacs.

The possessor of these curious appendages, whatever Howler it may be, for all the species of the genus have them, is active enough in his woods, but still is a sad-looking animal, much given to crawling listlessly from branch to branch, and becoming melancholy in captivity. They have a surly disposition, are never to be made pets of, and are savage; while at the same time they show none of the lively play which makes the Spider Monkeys and little Sapajous so very amusing. Possibly their howling exhausts much of their nervous energy, and certainly their brains are peculiar. The back, or occipital



YELLOW-TAILED HOWLER AND YOUNG.

part of the brain, does not cover the cerebellum, or little brain, which is large in proportion to the rest. The brain is small in comparison with those of the other American Monkeys, due allowance being made for the greater size of the Howler; and its surface markings or convolutions are few and simple.

There is much less brain-matter packed up in folds, or convolutions, than in most Monkeys, and some of the most important are wanting (the angular and external perpendicular), and it has a shrunken and contracted look. Everything shows a low condition of intelligence and mental power. The absence of so much brain-matter behind, so unusual amongst the Monkeys, has suggested to those who believe in phrenology that the bump of philo-progenitiveness was absolutely deficient in this species. But in spite of this, we find that the Howlers are kind to each other, and bring up their solitary little ones, teaching and feeding them with just the same amount of affection that all the other New World kinds display. So the love of offspring is not deficient; nevertheless, it may be assumed that the sameness of habits and the slight requirements of their lives render a more elaborate brain unnecessary.

Finally this and all the Howlers have the stomach a little disposed to be arranged as more than one single sac, and in this there is just the hint of the condition in the Semnopitheci of the Old World.

THE BLACK HOWLER.*

These Monkeys are called the Monos by the natives of Guatemala, and certainly deserve some other name than Howlers. Howling is a modest noise in comparison with the loud, widely-heard yell which they can produce. The effect of these noises when produced by four or five animals trying their voices one against the other in the quiet forest is most remarkable and unpleasant. Salvin thus writes:—"The wonderful cry whence Mycetes gets its trivial name of Howling Monkey is certainly

CAPARRO, OR HUMBOLDT'S LAGOTHRIX. (From the *Proceedings of the Zoological Society.*)

most striking, and I have sometimes endeavoured to ascertain how far this cry may be heard. It has taken me an hour or more to thread the forest undergrowth from the time the cry first struck my ear to where, guided by the cry above, I stood under the tree where the animals were. It would certainly not be over-estimating the distance to say two miles. When the sound came over the Lake of Yzabal unhindered by trees, a league would be more like the distance at which the Monos' cry could be heard."

The Monos are abundant throughout the forests of the eastern part of Guatemala, but are unknown in the forest-clad regions which stretch toward the Pacific Ocean. They are particularly plentiful in the unbroken forest country which occupies the northern part of Vera Paz, for seldom an hour passes without the weird outcry falling on the ear of the traveller even when at the height of 6,000 feet. At this height in a cold and damp region, where the forest trees are of the largest growth, these Howlers congregate in the upper branches of the highest trees. Living in small companies of five or six, they crawl sluggishly along the boughs when disturbed. It was from such a locality that

* *Mycetes villosus.*

those specimens of this species were found which are now in the British Museum. The animals afford a dark and not very nice meat, which is readily eaten by the Indians. The young as well as the females are of the same dense black colour as the old males, but the hair is shorter and not so glossy. All have the hair of the front part of the head long and soft, and inclined forward over the forehead nearly to the eyes. There are ten species of Howlers, and they are found in the forests covering the country from East Guatemala to Paraguay.

THE WOOLLY MONKEYS.*

Humboldt, in one of his geographical excursions amongst the great streams which feed the Orinoco, went far up towards their sources. Going once into an Indian cabin in those remote regions he saw a large Monkey, of a kind which he had never seen before. He named it, after the words of the natives, "The Caparro," and from its having a peculiar furry skin which reminded him of the familiar hare-skin of home, he termed it Lagotriche, from λαγώς (a hare), and θρίξ, τριχός (hair, or fur), and thus arose the genus about to be described.

Humboldt's new Monkey had a prehensile tail which was longer than the body, and underneath, close to the tip, there was a naked and sensitive spot of some length. It had a round and large head, a naked black face, but no beard. There were, however, smellers or long hairs around the mouth. It had long limbs and a shortish body, whose fur was long and sable-grey in colour. A good temper and a quiet disposition appeared to characterise this Monkey, and the natives said it was found in troops, and that it often stood upon its hind legs.

They have thumbs, as well shaped as those of any American Monkey, on the fore hands, as well as on the hinder extremities. They were deficient, however, in the howling apparatus, and therefore they differ from the Mycetes, and as their thumbs were noticed to be large, they differ from the next group of Monkeys, or the Spider Monkeys.

A careful examination of the skeleton shows that the outside differences are accompanied by inside ones, especially in the skeleton.

Thus, there are fourteen rib-bearing back-bones, or vertebræ, and this increase of number over the ordinary thirteen is interesting, because it makes the animal approach those lower than the Primates; then it has four loin vertebræ, and three are in the sacrum bone. There is a curious growth of the second vertebra of the neck or the axis, for its spine is trifid, and has three projections for the attachment of muscles. Finally, the long tail is very elaborate in its bony part, and seven of its bones near the root have so great a resemblance to the back-bones higher up in the body, that they have a canal like that which in the others protects the spinal marrow, which, however, does not reach further down than the lower loins. Then five of them have good strong spines, and all have the chevron or V-shaped bones underneath well grown.

This tail is quite as useful to the Lagothrix as it is to the Howlers and to the Spider Monkeys about to be considered, and they feel with, and swing and hold by it, to perfection.

The Caparro is about two feet two inches in length without the tail, and has been subsequently to its description by Humboldt called *Lagothrix Humboldtii*, or Humboldt's Lagothrix.

THE BARRIGUDO.†

Bates says of this Monkey, that it is, with the rest of those found in the district of the Upper Amazon, arboreal and diurnal in its habits, and that it lives in troops, travelling from tree to tree, the mothers with the children on their backs; leading, in fact, a life similar to that of some Indians, and like them occasionally plundering the plantations which lie near their line of march. The Barrigudo is the "big-bellied Monkey" of the Portuguese colonists, and they are very bulky animals. They have the head clothed with grey, and they live with the Caparro mentioned above, in the same forests, and lead the same kind of life. One measured twenty-six inches in length, and the tail six, and it was the largest Monkey he saw in America, with the exception of a

* *Lagothrix.* † *Lagothrix olivaceus.*

Black Howler, who was twenty-eight inches in length. The skin of the face of a Barrigudo is black and wrinkled, the forehead is low, and the eyebrows project; and, in short, the features resemble in a striking manner those of an old negro. It is not an active animal in the forests, and lives exclusively on fruits, but is much persecuted by the Indians on account of the excellence of its flesh as food. From information given to Mr. Bates he calculated that one troop of these Indians numbering about 200, destroyed 1,200 Monkeys a year for food. Consequently they are diminishing in numbers, and are not found on the Lower Amazon at all. Its manners in captivity are grave, and its temper is mild and confiding. Owing to these traits the Barrigudo is much sought after as a pet; but it is not hardy, and seldom survives a journey down the river.

There are five species of the Woolly Monkeys, and they are found in the valley of the Upper Amazon and along the slopes of the Andes to Venezuela and Bolivia (Wallace).

THE SPIDER MONKEYS—THE THUMBLESS MONKEYS OF AMERICA.*

Many early travellers recorded that during their wanderings by the sides of the rivers of the northern part of South America, and in the Isthmus of Panama, small troops of dark-coloured Monkeys could be seen rushing along amongst the trees, swinging under the branches, and feeding upon berries. Sometimes they would stop on the lower branches of the trees and look at the intruders; but usually they scampered off, swinging with their front limbs and clasping with the hinder, having their stout and long tail ready for emergencies. Their length of limb, slender bodies, long hair, and their long tail, by which they suspend themselves, and their extremely variable movements, soon gave them the name of Spider Monkeys amongst those interested in their habits, although, of course, the natives had some names of their own for them.

Humboldt saw them in the great virgin forests of Brazil, hanging in curious clusters, clasping each other by means of their limbs and tails, and all being suspended by the tail of one strong fellow. He was, as everybody must be, greatly impressed with their clever use of their tails, for he observed them being used as a fifth member, and with all the dexterity of hands. The natives will have it that they fish with their tails, but this is of course untrue, and they do not carry anything to their mouths with them. They are wonderful swingers and claspers, and they are exquisitely sensitive at the tip and for some inches underneath it, and they are stout where they join the body, exceedingly muscular, and in some kinds there are long hairs on them, especially near the end.

These Monkeys have small heads, long necks, and exceedingly long arms and legs; some are covered with a soft fur, and in others it is harsh, and the hairs are long and rigid; and all have the thumbs of the hands either absent or just visible as slight projections. The feet are long and have well-shaped toe-thumbs. Their head is round, and the muzzle only projects slightly, so that there is something human in their appearance, especially when their large eyes are open; and the hair in some kinds is brushed forwards on the cheeks and brows so as to resemble whiskers and front hair. There is something in their shape, without the tail, which reminds one of the Gibbons, those long-armed Apes of the East, and the fore-hands resemble those of the Colobi of Africa (page 100); but the Spider Monkeys have not the power of jumping possessed by these, and their hind legs, useful as they are when amidst the great trailing orchids and the climbers of the American tropics, are feeble members when on the ground. Then the Monkey walks on the outside edge of the feet, and on the inside edge of the hand, with its tail feeling here and there for anything to catch hold of. Often they are very sedate and slow in their movements, like the Semnopitheci of India, and they indulge in a series of climbings from bough to bough, swinging from one to the other, and holding on now and then and assisting in the movement with the tail. They are as gentle in their manners as those just mentioned, and are full of play with each other.

Their teeth resemble those of the Howlers, but the eye teeth, or canines, are smaller, and the crushing teeth, or molars, are rounder.

From the defective thumbs, all these Monkeys as a group or genus have been termed "imperfect-handed," and therefore two Greek words which convey these terms ἀτελής (imperfect), and χείρ (the hand), have been conjoined in the word Atelochirus, of which Ateles is used as an abbreviation.

* *Ateles.*

GROUP OF SPIDER MONKEYS

But on examining the hands carefully, and noticing the deep parts as well as the outside, it was found that they could be ranged into two sub-groups. In one there is no external appearance of a thumb, and in the other there is a stunted projection, but in both the member is not quite deficient so far as its bones are concerned. In the first group the metacarpal bone (the bone which is in man covered by the ball of the thumb, and which extends from the wrist to the first joint) is just seen, but it does not project; and in the second group there is one phalanx or thumb-bone on the metacarpal, and this sticks out and is covered with skin so as to resemble a hard pimple. In one kind this little thumb has no nail, and in another there is one on it.

It is curious that some of the woolly-haired kinds of Ateles should have no thumbs and others their rudiments; and that this should be the case in the long and harsh-haired kinds also. There are many kinds of Ateles, and there is consequently some difficulty in recognising them as species, and many attempts have been made to classify them, so that they might be readily distinguished. Those with short and thick thumbs have been called Brachytcles, and those without them Ateles; those with woolly fur have been termed Eriodes, but all are now included in the genus Ateles.

BRAIN OF THE SPIDER MONKEY.

Everybody is interested in seeing the curious sprawling swinging of the Ateles in the Zoological Gardens, and also in noticing the curious way in which some can place their hand right over the head nearly on to the opposite shoulder, and brush the hair with it forwards, and especially because both kinds of movement refer to the great length of the fore-limbs. On the contrary, although they can maintain the erect posture for a short time, they seem feeble about the hind limbs, which are shorter than the others. Their heel-bones are evidently short, so that leaping is never well done.

They are fruit and vegetable eaters, and enjoy eggs, and a nut occasionally, but they have no cheek-pouches. They have, however, an air-pouch, or sac, in front of the throat, but none of the noise-making gifts of the Howlers, and this sac enters the windpipe differently to those of the Monkeys of the Old World, and this is very curious. It opens into the windpipe below the cartilage which forms the "Adam's apple" in man, and not above and between it and the tongue. Below this cartilage, which is called the thyroid cartilage, there is another attached to it by which it joins on to the rings of the windpipe. The opening is between this lower cartilage, the cricoid,* and the top ring of the windpipe.

Their stomach is single, and the large intestine, as they are vegetarians, is large, and its termination the "cæcum" also, but it has no little worm-like appendage as in the Gibbons. No especial points have been noted in the muscular system, except the very curious fact that, although the bones of the thumb are so rudimentary, the muscles are all there except the one which principally bends it forward.

As the activity of the Spider Monkey is marvellous, as they swing on and catch hold of boughs with great skill and energy, and as they display much intelligence, their brains ought to be well developed. Doubtless there is a great deal of movement in these long-limbed creatures which takes place like the walking of man, *i.e.*, without direct thought, for we move our leg muscles, and all those which assist them in the act of walking, without a constant direction of the will. Just as man's walking is thus said to be done automatically, so much of the swinging and progression of the Ateles is produced without direct exertion of the will. But it is evident that the Spider Monkey judges his distance, and very often considers whether such and such a bough will bear his weight, and uses exactly sufficient muscular exertion for what he requires.

Moreover, there is a graceful co-ordination or mutual action of the muscles of the limbs, body, and tail to a common end in most of its movements which is evidently done by will. The movements of the tail are perfectly wonderful, and, indeed, so perfectly does it hold on, although the animal cannot

* κρικος, a ring: εἶδος, shape.

see what this long slender organ is doing, that most children think there is an eye at the end of it. Directly the Spider Monkey rises on its hind legs, up goes the tail straight behind its back, and curves a little at the tip downwards: the delicate hairs stick out and feel the slightest touch or passage of air; and the least touch induces the last few joints to clasp hold. The animal will walk along and catch hold of things with its tail at every other step or so, and will change its hold in exact proportion to its rate of progression. All these movements necessitate clasping, unclasping, twisting, and a regular succession of efforts, and are not likely to be carried out except by an animal with a well-developed nervous system. Hence it has been a matter of some interest to compare the brain of Ateles with those of other Monkeys, and even with that of man.

JAW OF THE SPIDER MONKEY.

Even in this Monkey, which is low in the scale on account of its having badly-developed thumbs, the structures of the brain greatly resemble those of the Monkeys of the Old World. The nerves are large in proportion to the substance of the brain, and the brain proper is narrow in front and hollowed out beneath, where it rests on the orbits. But these proofs of a low kind of intelligence and of great muscular power are accompanied by structures which mimic or sketch out those of the human brain in an extraordinary manner. The cerebellum, or little brain, is large, as it is the organ which has much to do with regulating and co-ordinating the movements of the muscles, but it is quite covered by the back part, or posterior lobes, of the brain. Inside the brain the cavities called the ventricles may be seen, and they are made on the human plan, for the cavity on each side (lateral ventricle) has a front part, a back part, and a deep one, and on its lower surface, or floor, certain roundings, which are called by odd names, such as the hippocampus minor and the hippocampus major. These are visible in the brain of Ateles as they are in man. Now, it is very remarkable, allowing for the difference in the size of the brain of most other Monkeys and of man, that the Spider Monkey should have larger posterior lobes to its brain than they have. Moreover, this unusual size produces a greater length of the back part (or horn, or cornu) of the lateral ventricle in Ateles. The difference, however, between the packing of the nervous substance of the brain in man and in the Spider Monkey is vast, for in this last there are few convolutions, but the principal are happily said by Huxley to sketch out the position of the most important in the human brain. The projection of the back part of the brain of the Spider Monkeys over the cerebellum is at least one-tenth of an inch. Hence there is much nervous matter in the back part of the brain, and this compensates for the narrowing and diminution of nervous matter in the front. Are the nerves, then, which give the Spider Monkey its wonderful power of activity and complicated movement, situated in the back part of the head? At present physiologists have not satisfactorily shown what are the offices of these back or occipital lobes of the brain; the rounded floor of the cavity in the brain, which goes by the absurd name of hippocampus, because it is curved like a "sea horse," and which is well seen in Ateles, has much to do with the sensation of touch, and the nervous matter at the sides of the brain appears to be connected with the nerves of the muscles of the limbs. The Ateles lead a life of very great sameness in their forests, and their perceptions and intelligence are never greatly stimulated, hence the fore part of the brain is small.

HAND OF THE SPIDER MONKEY.

THE COAITA.*

This is the Monkey of which an extraordinary story is told by Acosta. It belonged to the Governor of Carthagena, and was regularly sent to the tavern for wine. They who sent him put an

* *Ateles paniscus.*

empty pot in one hand, and the money into the other, whereupon he went "spidering," as Broderip terms it, to the tavern, where they could by no means get his money from him till they had filled his pot with wine. As the ganymede of the Governor came back with his charge, certain idle children would occasionally meet him in the street, and cast stones at him, whereupon he would put down his pot, and cast stones at them, till he had assured his way; then would he return to carry home the pot. And what is more, although he was a good bibber of wine, yet would he never touch it till leave was given to him. It is about as true as the account of the habits of the genus given by a distinguished French author. He says that they live in greater or smaller troops in the forests; their food consists of insects, and they also eat little fishes, mollusks (shellfish), and other animal substances. When they are a little way from the coast they sometimes come down to the beach by the sea-side and collect such things as oysters, and they get at the inside by breaking the shells between stones. Most of the species live far away from such luxuries, and one and all are vegetarians, as a rule, and eat an insect or suck an egg or two as the exception.

The Coaita, or Quata, is large for an Ateles, and is covered with long, coarse hair, of a glossy black colour, the under part at the groin being without any. The hair of the head is directed forwards, and conceals the ears, which have no lobe, and the face is of a reddish flesh-colour. It is an intelligent animal, and shows much curiosity when anything new is seen in its vicinity. All the agility of the genus is to be witnessed in its climbing and swinging from tree to tree; and it has no thumbs. They live in Surinam and in the Brazils. Bates, when living on the Lower Amazon, saw much of this Monkey, or Coaita, as he properly terms it. He describes it as a large black Monkey, covered with coarse hair, and having the prominent parts of the face of a tawny, flesh-coloured hue. Moreover, he found that the natives esteemed its flesh very much, and the military commandant of the place used to send out a hunter every week to shoot one for his table. "One day," writes this author, "I went out on a Coaita hunt, borrowing a negro slave of a friend to show me the way. On the road I was much amused by the conversation of my companion. He was a tall, handsome negro, about forty years of age, with a staid, courteous demeanour, and a deliberate manner of speaking. He told me he was a native of Congo, and the son of a great chief, or king. He narrated the events of a great battle between his father's and some other tribe, in which he was taken prisoner, and sold to the Portuguese slave-dealers. When in the deepest part of a ravine we heard a rustling sound in the trees overhead, and Manuel soon pointed out a Coaita to me. There was something human-like in its appearance, as the lean, dark, shaggy creature moved deliberately amongst the branches, at a great height. I fired, but only, unfortunately, wounded it in the belly. It fell with a crash headlong about twenty or thirty feet, and then caught a branch with its tail, and remained suspended in mid air. Before I could reload it recovered itself, and scrambled nimbly to the topmost branches, out of the reach of a fowling-piece, and we could perceive the poor thing apparently probing the wound with its fingers." He states that "Coaitas are more frequently kept in a tame state than any other Monkey. The Indians are fond of them as pets, and the women often suckle them when young at their breasts! They become attached to their masters, and will sometimes follow them to a considerable distance. I once saw a ridiculously tame Coaita. It was an old female, and had accompanied its owner—a trader on the river—on all his voyages. By way of giving me a specimen of its intelligence and feeling, its master set to and rated it soundly, calling it scamp, heathen, thief, and so forth, all through the vocabulary of Portuguese vituperation. The poor Monkey, seated on the ground, seemed to be in sore trouble at this display of anger. It began by looking earnestly at him, then it whined, and lastly rocked its body to and fro with emotion, crying piteously, and passing its long, gaunt arms continually over its forehead, for this was its habit when excited, and the front of the head was worn quite bald in consequence. At last her master altered his tone—'It's all a lie, my old woman, you're an angel, a flower, a good, affectionate old creature,' and so forth. Immediately the poor Monkey ceased its wailing, and soon after came over to where the man sat." The disposition of the Coaita is mild in the extreme. It has none of the painful restless vivacity of the Cebus, and no trace of the surly, untamable temper of the Howlers. Bates says it is an arrant thief, and that it shows considerable cunning in pilfering small articles of clothing, which it conceals in its sleeping-place. The natives of the Upper Amazon procure the Coaita when full grown by shooting it with the blow-pipe and poisoned darts, and restoring life by putting a little salt (the antidote to the poison with which the darts are tipped) in its mouth. The

animals thus caught become tame forthwith. Two females were once kept at the Jardin des Plantes, in Paris, and Geoffroy St. Hilaire says they rarely quitted each other, remaining most part of the time in close embrace, folding their tails round each other's bodies; they took their meals together, and never squabbled over their favourite fruit.

The same traveller when once very hard up for food was obliged to kill a white-whiskered Coaita, and cook it. He writes:—"I thought the meat the best flavoured I had ever tasted. It resembled beef, but had a richer and sweeter taste. We smoke-dried the joints, and the last one was an arm with the clenched fist. This I used with great frugality, hanging it between meals on a nail in the cabin, and nothing but the hardest necessity could have driven me to an act so closely resembling cannibalism."

COAITA

THE CHAMECK, OR TSCHAKMECK.*

An old author, Von Sack, in his voyage to Guinea, gives the following account of the manners of this Spider Monkey:—"It is of a very docile disposition, and capable of being quite domesticated. I have seen a pair of them at a gentleman's house at Paramaribo, which were left quite at liberty. When the female negroes were employed at their needlework, they used to come and sit amongst them and play with pieces of paper, and afterwards go and gambol amongst the trees, but never went over to the neighbouring gardens. They well knew the hour of dinner of their master, when they would come to the gallery, look in at the windows, though without attempting to enter into the room, being aware that this was a liberty which was not allowed them; they therefore patiently waited for their dinner outside."

The Latin name of this species refers to its having hardly five fingers. It has four and a short stump of a thumb, visible and useless, but consisting of two bones, the usual muscles, and the skin

* *Ateles sub-pentadactylus.*

covering. It is larger than the Coaita, and is black, and covered with long hair, but the face is brown. The tail is considerably longer than the body.

THE BLACK SPIDER MONKEY.

This Spider Monkey is more interesting for its geographical range and favourite localities than for anything else. It lives in Central America, north of Panama, and is common in the neighbourhood of the volcano called Orizaba, in the state of Vera Cruz. It lives in companies in the deep barrancas, up to an elevation of two thousand feet above the sea, and in the State of Oaxaca it roams in the forests up the country to a height of four thousand feet, being the same elevation to which the Tapir often reaches in its roaming. It is a black Ateles, with very long hair, which spreads out in all directions, but there is grey-white on the inside of the limbs, and underneath. It has no thumbs on the hands.

CHAMECK.

The position which the Ateles take in resting is often very curious. The great Apes of the Old World can lie on their backs like a man, and the Monkeys with callosities sit on them, and, drawing up the knees, let the head fall on to them, or on to the breast, bringing the arms forward when they sleep. But the want of callosities, and of the peculiar flatness of back which characterises the Anthropomorpha, prevents the American Monkeys from adopting either of these positions. Many lie on their sides, and others huddle up in parties, but the Ateles often lie across two or three rope-like horizontal stems, with the face looking downwards, a turn being taken by the tail round the support to insure safety. The length of the back has something to do with this, and of course with their extraordinary agility. The dorsal region of the back-bone, or that which bears ribs, is as long in comparison with the other (neck and loin) regions as in any Monkey; indeed, the maximum of length is attained. There are either thirteen or fourteen back-bone pieces (vertebræ), which have ribs attached to them. The lower vertebræ are four or five in number, and the tail is at its maximum of length in relation to that of the body, its pieces (caudal vertebræ) being very complicated near its root. There, eight pieces (vertebræ) are so like those of the back that they have spines, cross processes, of course without ribs, jointing processes, and a similar nervous canal to those which are higher up in the body. The spinal marrow does not go down it, however. Underneath them are the V-shaped or chevron bones. The end bones are short and thick.

THE VARIEGATED SPIDER MONKEY.*

These Monkeys appear to go in small parties, passing through the forests at a rapid pace, feeding on different kinds of berries. The berries which Mr. Bartlett found in their stomachs resembled a

* *Ateles variegatus.*

gooseberry with a large stone inside. Owing to their great length of limb and tail, and to their muscular vigour, these Spider Monkeys travel far and wide. They are found on both sides of the Peruvian Amazon (or Marañon), and on both sides of the Huallaga. They are also common on the Rio Tigri, and range along the lower spurs of the Andes, across Ecuador and Columbia, over the head waters of the Rio Napa, Rio Japura, and Rio Negro, where it was first discovered. They have also been found in Venezuela. Bartlett endeavoured to hunt them on the Rio Tigri, a small tributary that runs into the Amazon about four miles above the town of Nanta, on the north-western shores of the Peruvian Amazon, but was prevented by the fever and ague of the climate, and the fears of the Indians. Going into the mountains up the Marañon River, he heard from the Indians of the presence of a long-armed Ape—called in their language Maciosuppeh—at the distance of three days' journey. He engaged three Indians, started by way of a forest footpath that had been opened by a Catholic priest, to the town of Moyahamba, as part of his penitence. He writes :—"At the end of three days I reached the highest point of the mountains ; here we came across a number of the Monkeys in question—about eight or nine. I shot the male that is now in the British Museum, and my Indians brought down another with a poison-dart. Having obtained two of them I was satisfied that I had found a new species. While, however, I was busily engaged preparing the first specimen, my Indians had quietly placed the other on the fire ; and, to my great horror and disgust, they had singed the hair off, and thus spoiled the specimen. Of course I was obliged to keep the peace, for they had not tasted meat for some days, and the Monkey proved a very dainty dish."

THE HOODED SPIDER MONKEY.*

Probably one of the most extraordinary-looking creatures in the world is *Ateles cucullatus* (Gray). This very spidery-looking Monkey has a very curious head of hair, which looks as if it sadly required cutting, for it comes over the forehead, and forms a regular hood, which expands over the eyebrows. Everywhere the fur is long and flaccid, and of a blackish silvery-grey colour. The face is reddish, the cheeks and lower jaw being nearly bare of hair ; the skin, however, is of a black shade. The skin around the orbits and upon the nose is bare, and of a brownish flesh-colour. The body is about fourteen inches, and the tail twenty-seven inches in length. The tail is stout near the body, and becomes very slim towards the end, the greater part of it, especially the under surface, being extremely hairy. The length of the hind feet, the long scraggy limbs, the spare, long body, and its great agility, give the Monkey a most extraordinary appearance. Probably it comes from the northern coast of Columbia.

There are many species of Ateles, and they range on the Pacific side of Guatemala, on the west side of the Andes, and in the forests watered by the great rivers.

THE SAJOUS, OR CAPUCHINS.†

If attention has been paid to these descriptions of the groups of American Monkeys already dealt with, it will have been evident that they can readily be distinguished one from another. Thus, the Lagothrix has a round head without a beard, a prehensile tail, with the hair off it underneath, not far from the tip, and its thumbs are large ; the Spider Monkeys, or Ateles, have small heads, the same kind of tail, and their thumbs are either defective or wanting altogether ; and the Mycetes, or Howlers, have high heads and beards, thumbs, the same kind of tail, and the howling apparatus in perfection. Now, the next (and last) genus of prehensile-tailed Monkeys differs from all these in not having the naked spot on the under side of the tail, in having a thicker tail, and a gentle whistling voice. These are the little "masters of the woods," according to Azara, and should be called "Cai" (the "C" is soft), which has been altered to Sajou by the extraordinary talent which the French have of confounding spelling and sounds in other languages. Buffon divides the Monkeys noticed above into the *Sapajous* and the *Sagoins*, the larger kinds belonging to the first, and those about to be noticed to the last. He modified, he says, the words *Cayonason* and *Cayoni*, their *C* being pronounced as *S*.

* *Ateles cucullatus.* † *Cebus.*

But Azara says that the real words are Caigonazon and Cai, they being pronounced as written, and the first means Great Cai, and the last Cai, or Cay, simply Monkey. Sajous is a derivation from Cagoui, and animals properly included by it constitute the genus *Cebus*, but to add to the confusion, Mr. Wallace calls them "Sapajous."

They are the small, active, red-faced, round-headed, long-tailed American Monkeys, which curl the end of the tail downwards, and yet use it to hold on by. They are smaller and more delicate than

BLACK AND VARIEGATED SPIDER MONKEYS.
(From the *Proceedings of the Zoological Society*.)

those already described; their teeth are smaller, and they have not large canines like the Mycetes. Vrolik, in noticing the gentle expression of their face, says their movements are graceful and gay, and their "manners a mixture of sweetness, cleverness, agility, and lubricity!"

There is abundant proof to be obtained of their agility and intelligence, and, unfortunately for them, their gifts are valuable in the eyes of Monkey-trainers, and many a little pug, dressed up as a Highlander or soldier, who does tricks in the streets for the benefit of his master, once had a gay life of "lubricity" in the virgin forests of the Amazon.

Bates, in his interesting work, "The Naturalist on the Amazon," refers especially to the following species—

THE CAIARÁRA.*

This (according to this author and admirable observer) is the light-brown Caiarara, and it is pretty generally distributed over the forests of the level country. He saw it frequently on the borders of the Upper Amazon, where it was always a treat to watch a flock leaping amongst the trees, for it is the most wonderful performer in this line of the whole tribe. The troops consist of thirty or more

HOODED SPIDER MONKEY.

individuals, which travel in single file. When the foremost of the flock reaches the outermost branch of an unusually lofty tree, he springs forth into the air without a moment's hesitation, and alights on the dome of yielding foliage belonging to the neighbouring tree—may be, fifty feet beneath—all the rest following the example. They grasp in falling with hands and tail, right themselves in a moment, and then away they go along branch and bough to the next tree. It owes its native name to the disproportionate size of the head to the body. It is very often kept as a pet in the houses of the natives, and Mr. Bates kept one for a year, and he thus writes about it:—"It accompanied me in my voyages, and became very familiar, coming to me always on wet nights to share my blanket." It is a most restless

* *Celus albi'rons.*

creature, but is not playful like most of the American Monkeys, the restlessness of its disposition seeming to arise from great nervous irritability and discontent. Its actions are those of a wayward child. It does not seem to be happy even when it has enough of its favourite food—bananas; but will leave its own meal to snatch the morsels out of the hands of its companions. It differs in these morbid traits from its nearest kindred, for another Cebus found in the same parts of the forest—the Prego Monkey—is a much quieter and better-tempered animal. It is full of tricks, but they are generally of a playful character.

The Caiarára keeps the house in a perpetual uproar where it is kept. When alarmed or hungry, or excited by envy, it screams piteously, and it is always making some noise or other, often screwing up its mouth, and uttering a succession of loud notes resembling a whistle. Mr. Bates's little pet used to run after him, supporting himself for some distance on his hind legs, without, however, having been taught to do so. The end of this friendship came at last, and in a tragical manner. "He offended me greatly one day by killing, in one of his jealous fits, another and much choicer pet—the Nocturnal Owl-like Monkey (*Nyctipithecus trivirgatus*). Some one had given this a fruit which the other coveted, so the two got to quarreling. The Nyctipithecus fought only with its paws, clawing out, and hissing like a Cat. The other soon obtained the mastery, and before I could interfere, finished its rival by cracking its skull with his teeth. I then got rid of him."

BROWN CAPUCHIN. (*From the Zoological Gardens.*)

Broderip writes about one as follows:—"Humboldt saw at Maypures one of these Monkeys riding a Pig. He used to bide his time, and every morning caught one, which he compelled to perform the part of the horse. Seated on pig-back did he majestically ride about the whole day, clinging to his bristly steed as firmly as ever the Old Man of the Sea clung to Sindbad, not even giving poor piggy a respite at meal times, but continually bestriding him all the time he was feeding in the savannah that surrounded the Indian huts. A missionary had another of these riders, but the missionary's Monkey laid a strong hold on a comfortable Cat which had been brought up with him, carried him well, and bore all his tricks with patience and good humour."

The skull is long, and uniformly round in these animals, and the face is not very prominent. There are two nasal bones, and the inter-maxillary bone is distinct; moreover, the chin is rounded and receding. With all its powers of teasing, fun, and its intelligence, one would anticipate that the brain would be far superior in its form to the Spider and other Monkeys with prehensile tails; and this is the case, for the convolutions on the outside are almost equal in their number and relative size to those of the Monkeys of the Old World.

There are eighteen kinds of these Capuchins, and the attempt has been made to classify them by the direction of the hair of the head and its colour, but in doing this sufficient allowance has not been made for the influence of sex, age, and the bodily vigour, so that great confusion still exists in their classification.

THE BROWN CAPUCHIN.*

In this species the hairs of the head are brushed back, but it appears that with age some hairs are erected at the sides of the head above the ears into two horns, so as to give it the name of the Horned Monkey.

* *Cebus fatuellus.*

THE WEEPER CAPUCHIN, OR CAI.*

This is known by the black top to its head, and it is small, and brown in colour elsewhere, the face and throat being greyish-yellow.

Brehm gives the following notes about their habits :—"This Monkey is common from Bahia to Colombia, and it chooses wooded country where there is no underwood. The greater part of its life is spent on trees, and it only leaves them to drink, or to visit a field of maize. In the day he wanders from tree to tree, looking for food; in the night sleeps on the branches of some tree. Generally one sees him in small families of six or ten, of whom the most part are females. It is difficult to observe the animal, because he is so timid and shy. Rengger asserts that he is seldom to be seen. Once he noticed a pleasant whistling noise, and he saw an old male looking timidly around on the highest tree-tops, and then approach. About twelve or thirteen others followed him, of both sexes, and three females carried a little one partly on the back, partly under one arm. Suddenly one of these animals saw an orange-tree with ripe fruit, gave a cry, and sprang up the tree. In a few seconds the whole company were assembled there, and were engaged in picking and eating the ripe fruit. Some began immediately to eat, others sprang, loaded with a couple of fruit, to a neighbouring tree, whose stronger branches provided them with a table. They sat themselves down on a branch, encircled it with their tails, then took an orange between their hind legs, and tried with these to loosen the peel at the top with their fingers. If they did not succeed immediately, they flung the fruit, grumbling and snarling, several times against a tree, by which the rind was broken. Not one tried to peel the orange with their teeth, probably because they were aware of its bitter taste. As soon, however, as a small opening was made, they quickly pulled a piece off, eagerly licked up the juice, not only what was on the fruit, but also what was on their hands and arms, and then ate the pulp. The tree was soon bare, and then the stronger ones tried to rob the weaker, both making the most peculiar grimaces, gnashed with their teeth, tore each other's hairs, and pulled each other roughly about. Others carefully searched the dead branches, lifted up the dry bark, and ate the insects lying underneath. When they were satisfied, they laid themselves along a branch, in the same manner as the Howlers, to sleep. The young ones, however, began to play, and thereby showed themselves to be very agile. They swung themselves by their tails, or climbed up them as if by a rope. The mothers had great trouble with their young, who wished for the luscious fruit. At first they gently pushed their young aside, but afterwards showed their impatience by grunting; then they seized the disobedient child by the head, and threw it roughly on its back. As soon, however, as they were satisfied, they gently drew the young ones forward, and laid them at their breasts. The mother's love shows itself by the great care with which every old one handles her young, through laying them on the breast, by watching them, by searching their fur, and by the attacks on others who come near. The motions of the young one were neither light nor graceful, but awkward and ungainly. Another time Rengger came upon a family who were about to make an attack upon a maize-field. They climbed softly down from a tree, looked carefully around, broke two or three heads of fruit off, and returned as quickly as possible to the wood, there to devour their booty. As Rengger showed himself the whole troop fled, with shrill cries, through the tree-tops. Every one, however, took at least a head of fruit away with him. Rengger now shot one of these, and saw a female fall with her young one through the branches. He thought he should be able to catch her soon, but, though dying, she caught herself by her tail, and kept him waiting for quite a quarter of an hour. The young one had not left its mother, but rather clung faster to her, though showing signs of fear. After she was dead, and it was taken away, the little thing called in plaintive tones to its mother, and crept near to her as soon as it was let loose. After some hours, however, the coldness of the body seemed to frighten the young one, and it willingly stayed in its captor's breast pocket. Our informant says that in the family of the Cai, the number of females exceeds the number of males. In January the female gives birth to a young one, and keeps it at her breast for the first week, but later on carries it on her back. The mother never leaves her young, not even when she is wounded. Rengger, however, observed that a female, whose arm had been broken by a bullet, tore her young one

* *Cebus capuchinus.*

from her breast, and set it on a branch; but this most likely was to shield the young one from danger rather than to relieve herself of its weight.

"The young Cai is often caught, and tamed. When older they cannot bear restraint; they become mopish, refuse their food, never grow tame, and die in a few weeks. The young one, on the other hand, soon forgets its freedom, becomes attached to people, and partakes, as do many other Monkeys, of their food and drink. They walk on their hind legs for three or four steps, but they are trained to walk upright by tying the hands behind the back. At first they fall frequently, and must therefore be held by a cord from behind. When sleeping they curl themselves up, and cover the face with the arms and tail. They sleep in the night, and when it is very hot, in the middle of the day. At other times they are in constant motion.

"Among the senses of the animal the sense of feeling is the most acute. It is short-sighted, and cannot see at all by night. It does not hear well, for it can be easily surprised. It holds everything that has smell to its nose, and it is often deluded by the smell into tasting what its taste tells it is not fit to eat. The sense of feeling makes up in some measure for the others. It shows itself chiefly in the front hands, less in the hinder, and not at all in the tail. Through practice and teaching this faculty can be greatly cultivated.

"Rengger's Cai knew his master in the darkest night, as soon as he had felt his usual clothing. The cry of the Cai changes according to its emotions. One generally hears a whistling sound, which seems to proceed from weariness. If he demands anything he groans; wonder or embarrassment he shows by a half whistling tone; when angry he cries in a deep, rough tone—'Hu! hu!' When in fear he shrieks; when pleased he chuckles. By these cries the leader of a troop shares his feelings with the others. These they show also, not only by noises and motions, but also by a kind of laughing and crying. The former is the drawing back of the corners of the mouth; but he utters no sound. When crying his eyes fill with tears, which however, never flow down his cheeks. The Cai is very sensitive to cold and damp, and must be kept from them if he is wanted to keep well. This is easy, as he gladly rolls himself up in a blanket. They live about fifteen years.

"The intelligence of the Cai is worthy of notice. He learns in the first few days of his captivity to know his master and his keepers, and looks to them for food, warmth, protection, and help; trusts them fully, is pleased when his keeper plays with him, lets himself be teased by him, and after not having seen him for some time shows the greatest pleasure on his reappearance. He also soon forgets his freedom, and becomes almost wholly a domestic animal. An old male which Rengger had got loose once from his cord, and ran away into the wood, but returned again in two or three days, sought out his keeper, and allowed himself to be tied up. Those who are not badly treated show great fidelity, especially to the blacks, whom they like always better than the whites. The Cai is not only fond of men, but also of animals, and it is no uncommon thing in Paraguay to bring him up with a young Dog, who serves as a horse for him.

"The animal is very sensible, and does not give in to the will of man. One can keep him from doing anything, but cannot force him to do it. On the contrary, he tries to make others bend to his will, and also men, sometimes by caresses, sometimes by threats. Weaker animals must follow his will. This does great harm to his learning. He will only learn those things which he can make use of, such as opening boxes, looking through his master's pockets, &c. As he grows older he gains experience, and knows how to use it. If one gives him an egg for the first time, he breaks it so clumsily that he loses half the contents, but the second time he only breaks the top, and lets no more be lost. He is not often taken in twice by anybody. He soon learns to know the expression of the face, and the tone of the voice.

"The Cai is also very prone to stealing eatables. If caught in the act he cries out with fear before he is touched, but if he is not caught then he pretends to be perfectly innocent, and looks as if nothing had happened. Small articles he hides, when disturbed, in his mouth, and eats them at his leisure. His covetousness is great. What he once gets in not so easily taken away, at the most, by his master, when he likes him very much. His covetousness is made use of to capture him. The niggers clean out a pumpkin through a small hole, and then slip pieces of sugar, &c., inside. They see this, and thrust their arm in, and while so engaged will rather be caught than relinquish their spoil. Besides these qualities, they show curiosity and destructiveness to a great extent.

"They are fond of teasing, and pull the tails of Dogs and Cats, snatch the feathers out of Hens and Ducks, and even tease Horses which are tied up close to them; they also pull their bridles, and are all the more pleased the more worried or frightened the animal becomes.

"Only the Indians make use of the skin, and therefore hunt the Cai down with bow and arrow. The whites prize him most highly in captivity."

Some of these little Monkeys really appear to reason, and are very clever. Rengger states that when he first gave eggs to his Monkeys they smashed them, and thus lost much of their contents; afterwards they gently hit one end against some hard body, and picked off the bits of shell with their fingers. After cutting themselves only once with a sharp tool they would not touch it again, or would handle it with the greatest care. Lumps of sugar were often given them wrapped up in paper, and

WEEPER CAPUCHIN, OR CAI.

Rengger sometimes put a live wasp in the paper, so that in hastily unfolding it they got stung. After this had happened once they always first held the packet to their ears, to detect any movement within.

This breaking of the egg in a proper manner is as interesting as two well-known facts, one of which may be observed by anybody in the habits of American and other Monkeys. Sometimes a little Monkey has a nut given him, and he is not strong enough to crack it. He will look up into your face with a meaning glimmer of his eyes, and hand you the nut again. Crack it for him, and he receives it as a matter of course. Formerly one of the large Monkeys in the Zoological Gardens had weak teeth, and he used to break open the nuts with a stone, and Mr. Darwin was assured by the keepers that this animal, after using the stone, hid it in the straw, and would not let any other Monkey touch it.

Rengger taught one to open palm-nuts by breaking them with a stone, and so satisfied was it with its performance, that it soon began to experiment on other kinds of nuts, and then it began upon boxes. It also crushed off with blows of a stone the soft rind of a fruit that had a disagreeable flavour, in order to get at the luscious food within.

Some interesting observations were made by Rengger in Paraguay on the diseases of these Monkeys in their natural state. One kind of Cebus was found liable to what we call "colds," or, medically speaking, catarrh. It had all the usual symptoms; was uncomfortable evidently for a while, had a stuffiness in the head, and then its nose ran like that of a child. If the colds occurred over and over again the same result took place as happens in man, for symptoms of consumption came on, and death ensued. Moreover, these same Monkeys suffered from apoplexy, inflammation of the bowels, and even from cataract in the eye. Even the tiny ones suffered like human babies in cutting their second set—or rather in shedding their milk, or first set—of teeth. They became feverish, and often died with the symptoms of fever on them.

The same author saw a Capuchin Monkey taking great and affectionate care of its infant. The flies were teasing it, and the mother drove them away as sedulously as possible. When in its native woods the Cebus Azaræ utters at least six distinct sounds when it is excited, and these seem to produce corresponding feelings in the Monkeys which are listening.

The Capuchins range from Costa Rica to Paraguay.

CHAPTER IX.

THE CEBIDÆ (*concluded*)—THE SQUIRREL MONKEYS—DOUROUCOULIS—SAKIS.

General Description of the Second Division of Cebidæ—Without Prehensile Tails—THE SQUIRREL MONKEYS—Described by Buffon and Humboldt—Peculiarities of the Species—Anecdotes by Le Vaillant—A Tragic End—THE WIDOW MONKEY Origin of the Name—THE ONAPPO—Its Nocturnal Habits and Peculiar Cry—THE DOUROUCOULIS OR OWL MONKEYS—General Description of the Family—Peculiar Formation of the Arm-bone—THE THREE-STRIPED OWL MONKEY—Described by Humboldt and Bates—THE RED-FOOTED DOUROUCOULI—THE SAKIS—Remarkable Resemblance in the Face to Man—Structural Peculiarities—THE COUXIO—THE PARAUACÚ—THE MONK—Description of the Brain—Other Varieties of the Sakis—Anecdotes of them—THE BLACK-HEADED SAKIS—General Description.

NONE of the remaining groups or genera of these Monkeys of the New World have tails by which they can hang on with, or by the aid of which they can swing or cling when falling. Some kinds may curl the tail around a bough, or use it in their rapid side movements, after the manner of other animals, but it is never truly prehensile.

This deficiency in the prehensile capacity of the tail is, of course, accompanied by an absence of the elaborate tail structures, and the end bones especially are no longer flattened, so as to grasp easily, but are round.

There are other signs of their having a less elaborate conformation than the prehensile-tailed; thus, the front teeth project, or are prominent obliquely in all but one genus, and the feet and hands resemble those of quadrupeds more than ever. In fact, having descended the scale of Monkeys nearly to the bottom, resemblances with the next groups of animals are becoming more and more apparent. Just as the Monkeys of the Old World—the Baboons—resemble the carnivorous animals in many points, so these non-prehensile-tailed Monkeys of the New World have many likenesses with the Lemuroida, and with insect-eating animals, and the smaller they are the greater is the resemblance. There are two divisions of the Monkeys without prehensile tails. In one, the species have the same number of teeth as Mycetes and Ateles; and in the other they have only thirty-two teeth.

In the first division are the Squirrel Monkeys, the Sakis, and the Douroucoulis, forming respectively the genera Callithrix, Pithecia, and Nyctipithecus; and in the second there are the Marmosets and Tamarins, of the genera Hapale and Midas. The second division is distinctly separated from the other by some comparative anatomists, and forms the group of "Arctopitheci," or Bear Monkeys.

GENUS CALLITHRIX*—THE SAIMARIS.

Callithrix means lovely hair, from κάλλος and θρίξ, and merely refers to the pretty fur of these Monkeys, and gives no insight into their peculiarities, and is a mere name. It includes the Squirrel Monkeys, which are distinguished by having good-sized canine teeth, and by the first crushing tooth

* This genus is sometimes divided into two—*Callithrix* and *Chrysothrix*

being conical in shape, and having an extra tubercle on its base; on the other hand, there are other kinds in it which have short canine teeth, such as the Widow Monkey.

All have the peculiarities of the non prehensile-tailed group, but their front teeth do not project forwards. The tail is round and slender.

THE SQUIRREL MONKEY.*

Buffon was a great admirer of this long-tailed, very human-headed little Monkey, and remarked that they will always be admired more than any other of their American brethren, on account of their littleness, the gentleness of their movements, their brilliant colour, their large and striking eyes, and their little round faces. He noticed that although the tail was long it was not stout and muscular, as is the case in those which are prehensile; and he observed that they were fond of curling it around objects, and even around their own or their mate's bodies. Their grey olive body-fur contrasts with their bright red arms and legs, whilst the muzzle is blackish, and these colours, on an active little creature whose body is about ten inches long, and whose tail is not quite fourteen, look very pretty.

Humboldt often had the opportunity of watching the Saimaris, and was much impressed with their affectionate disposition, and says that they readily wept if they were spoken to in a sad manner. When they are spoken to for some time they will listen with great attention, and then will place their little hands to the speaker's lips. The attempt suggests the great trouble to catch the words as they come out of the mouth. They knew objects when they saw them in pictures, and even when they were not coloured, and when they represented their usual food, such as fruit and insects, they endeavoured to catch hold of them. They entertained a great desire to catch Spiders, and caught them with great skill, either with their hands or mouths.

They feel any sudden change in the temperature of their native woods very soon, and when there is a fall of some degrees in the thermometer, they collect in little troops, and huddle together for the sake of their mutual warmth. There is a vast deal of squabbling and fighting to see who shall get in the middle, and not be left out in the cold, and great is the whistling and squeaking. Unfortunately for the noisy creatures, the Indian hunters take advantage of their assembling in this manner, for when they hear the cries they shoot their arrows in the direction of the Monkeys, and often hit the chilly little group. It is said that when young they have a slight smell of musk.

The Squirrel Monkeys have a small face, and the brain-case behind it is moderately arched above, and sticks out behind very decidedly. This is because the head is placed on the spine differently to the Monkeys already described. In them the opening in the under part of the skull, for the passage of the spinal cord (the foramen magnum) is far back, but in the Squirrel Monkeys it is much further forward; so far forward, indeed, that there is enough room for brain matter behind it to allow the back part of the brain to be relatively larger than in man. Huxley remarks that in this Monkey the cerebral hemispheres (that is to say, the whole of the "brain proper") project beyond the cerebellum to a greater relative extent than in any other Mammal nearly by one-fifth of their total length. But the fore part of the brain is small, and there are very few convolutions. On referring to the description of the Howlers, this great difference will be appreciated. Gervais, with a laudable desire to account for the great development of the back part of the head, insists on the great love the young show their mother, not leaving her even when she is dead. The orbits of this Monkey are large, and are close together; they are not perfectly separated by bone, for a membrane shuts one off from the other; and the cheek-bone has not the round hole in it which is observed in the Spiders and Howlers. As a whole, the head is very human-like, especially when it is young; but the forehead-bone is triangular, and projects upwards and backwards between the side bones of the head, and the chin is round and prominent. The forehead is narrow, and the muzzle is more protruding, however, than in man.†

Le Vaillant, in his introduction to his first voyage, gives the following curious instance of the exhibition of their instinct of clinging to their mother under extraordinary circumstances:—When living in

* *Callithrix sciurea.*

† It appears to be a long-backed little thing, and this is not because it has more rib-bearing back-bones than the Monkeys of the Old World; on the contrary, they usually number only eleven. As regards the skeleton, the hips appear to be weakly joined on to the spine and to each other by one bone, instead of there being a long and strong sacrum to unite them. The breast-bone has only four pieces between the upper one (or the manubrium), and the cartilage at the lower end.

Dutch Guiana, at Paramaribo, where he was born, and where he had already, though very young, formed a collection of insects, the future traveller and his party in one of their excursions had killed a female Monkey. "As she carried on her back a young one, which had not been wounded, we took them both along with us, and when we returned to the plantation, my Ape had not quitted the shoulders of its mother. It clung so closely to them, that I was obliged to have the assistance of a negro to disengage them; but scarcely was it separated from her, when, like a bird, it darted upon a wooden block that stood near, covered with my father's peruke, which it embraced with its four paws, nor could it be compelled to quit its position. Deceived by its instinct, it still imagined itself to be on the back of its mother, and under her protection. It seemed perfectly at ease on the peruke. I resolved to suffer it to remain, and to feed it there with Goat's milk. It continued in its error for three weeks, but after that period, emancipating itself from its own authority, it quitted the fostering peruke, and by its amusing tricks became the friend and favourite of the whole family;" though it is difficult to suppress a smile at the idea of a Monkey clinging to a full-bottom on a wig-block, and fancying it its mamma. The story, as it begins mournfully with the slaughter of the poor mother, ends tragically for her unhappy offspring. It died a terrible death—the result, indeed, of its own mischievous voracity, but in agonies frightful to think of. "I had, however," continues Le Vaillant, "without suspecting it, introduced the wolf among my flock. One morning, on entering my chamber, the door of which I had been so imprudent as to leave open, I beheld my unworthy pupil making a hearty breakfast on my noble collection. In the first transports of my passion I resolved to strangle it in my arms; but rage and fury soon gave place to pity, when I perceived that its voraciousness had exposed it to the most cruel punishment. On eating the Beetles it had swallowed some of the pins on which they were fixed, and though it made a thousand efforts to throw them up, all its exertions were in vain. The torture which it suffered soon made me forget the devastation it had occasioned. I only thought of affording it relief; but neither my tears, nor all the art of my father's slaves, whom I had called from all quarters with loud cries, were able to preserve its life."

THE WIDOW MONKEY.*

The Monkeys in the second division of this genus have the canine teeth not so long as in the other, and the two middle upper incisors are broad. It contains the Widow Monkey.

This rare and pretty little animal has been compared, and not unaptly, to a diminutive black Dog with a white face. Its whole colour, in fact, is of a uniform shining blackness, with the exception of the face, neck, and arms, which are dull white, the former being surrounded with a narrow band of pure white. This remarkable disposition of colour has obtained for it, from the Creoles, the fanciful name of Widow Monkey, the whiteness of the face, neck, and arms being compared to the veil, handkerchief, and gloves worn in its native country by widows. It is described as particularly gentle and timid, except when a small bird—its natural food—is placed in its sight; it then becomes animated and eager, darts at it like a Rat, and devours it in an instant; at other times it will remain motionless for hours, attentively watching whatever is going on. It seems, however, to have a particular aversion to its hands being touched, since they are immediately withdrawn, and hid under its belly. It evinces a great dread of other Monkeys, but not those of its own species. Of its native history we are entirely ignorant. The usual length of the body is not more than one foot. The head is round, the muzzle short, and the general expression of its physiognomy is agreeable. The colours we have already noticed. The nose is short and flat, and the ears are almost naked. The hands are nearly white on the outside, but black within, and the hinder hands, or more properly feet, are entirely black; the tail is also black, and a little longer than the body. Very probably this pretty Monkey is only a variety of Callithrix amictus, which has a blackish-brown fur, with the under half of its throat white, and the hands are of a dull yellow or whitish colour.

THE ONAPPO.†

This Monkey belongs to the same division of the genus as the Widow Monkey, and it is interesting because its habits are nocturnal. It feeds and roams by night instead of by day. Doubtless

* *Callithrix lugens.* † *Callithrix discolor.*

many other kinds do so, but it has been recorded of this species from its first discovery. They live in Para, and in the Brazils, and are remarkable for the agile and graceful way in which they jump from tree to tree, the females carrying the little ones on their backs, and moving with the vivacity and restlessness of birds. Resting during the day, they roll themselves up like balls, and utter plaintive, deep-seated, weary cries, which have given them the name of Ventriloquist Monkeys. At night they

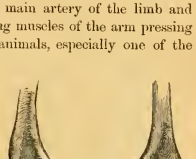
CALLITHRIX AMICTUS.

are all life and movement, and then they search for insects and eggs, and enjoy themselves. Their colour is a reddish-grey, and spotted on the upper parts of the body, and beneath and on the limbs the tint is of a vivid maroon. The tail is grey, tipped with white. There are fourteen species of the genus, and they range to the southern limits of the great forests.

GENUS NYCTIPITHECUS—THE DOUROUCOULIS—THE OWL MONKEYS.

The name given to these Monkeys conveys their habit of sleeping by day, waking up in the evening, and leading a very restless life during the greater part of the night. They are small animals,

with a large round head, short face, and very large eyes; their fur is kept close; they have a tail of some length, but it can only curl around objects without holding on. The body is short, and greatly resembling that of the Squirrel Monkey in some points. They are distinguished as follows:—The two middle upper front teeth (incisors) are broad, and the lower ones project in a slanting direction; the canines are moderately long. The ears are partly hidden amongst the hair of the head, and the eyes are large. There is a curious condition of the upper arm-bone (humerus) of these Monkeys, which they have in common with the different kinds of Cebus, the Squirrel Monkeys, and the little Ouistitis about to be mentioned. It is, moreover, seen in the Carnivora, or the flesh-eating animals. The lower part of the bone, where it is jointed to the two bones of the fore-arm, at the elbow, has one of its projections there (the inner condyle) perforated by a hole. This gives passage to the main artery of the limb and the main nerve, and the use of it appears to be to prevent the contracting muscles of the arm pressing upon these important structures. They resemble some of the lower animals, especially one of the Lemuroida, of the genus Stenops, in the length of the loin back-bones; and, indeed, relatively this lumbar region is longer in them than in any other Monkey. The rib-bearing back-bones are more numerous than in other Monkeys, and there are either fourteen or fifteen of them, and, moreover, their spines are much prolonged forwards, as in carnivorous quadrupeds.



ARM-BONE OF OWL MONKEY.

THE THREE-STRIPED OWL MONKEY.*

This is another of the interesting objects first made known to us by the researches of M. Humboldt, who described it as one of the most remarkable Monkeys of South America. According to the account of this well-known traveller, its habits are completely nocturnal, as it wanders about only during the night, and retires into hollow trees, or rather recesses, to sleep away the day. In captivity it generally composes itself to rest at nine in the morning, and continues in that state until seven in the evening; if, during this period, it is awakened, it becomes melancholy, listless, and stupid, and seems to have much difficulty in opening its large, owl-like eyes. M. Humboldt's figure represents the animal dormant. No sooner, however, does the setting sun bring the return of twilight, which to him is his "opening day," than our little Monkey becomes all life and impetuosity. He then commences his hunt (if unconfined) after small birds, insects, and probably fruits, since he shows no objection to the latter aliment when in captivity. This carnivorous disposition may probably account for the extreme difficulty with which this species is tamed. An individual in the possession of the traveller, and which he kept for nearly five months, could not be reconciled to captivity. It slept during the day, hiding itself in the darkest recess it could find. It seldom played with its master, but showed particular cleverness in capturing flies, and, if irritated, it hissed and struck with its paw like a Cat, the throat being at the same time inflated. Its voice, for so small an animal, is extremely powerful; at times it is described as faintly resembling the howl of the American Tiger, or Jaguar; and at others to be a kind of mew, accompanied by a disagreeable guttural sound. The hair is grey, mixed with white, and glossed with a silvery lustre. The centre of the back is marked by a brown line, and on the head and forehead are three others, diverging, and of a black colour. The chest, belly, and under surface of the limbs are yellowish-orange. The face resembles that of a Cat, and is covered with blackish hairs. The eyes are very large, and the ridges of a bright yellow. The tail is bushy, and half as long again as the body, which measures nine inches and a half.

Mr. Bates is quoted in the following passages with reference to this and other kinds of Nyctipitheci, and their resemblances:—

"An interesting genus of Monkeys, found near Ega, are the Nyctipitheci, or Night Apes, called Ei-á by the Indians. Of these I found two species, closely related to each other, but nevertheless quite

* *Nyctipithecus trivirgatus.*

distinct. as both inhabit the same forests, namely, those of the higher and drier lands, without mingling with each other, or intercrossing. They sleep all day long in hollow trees, and come forth to prey on insects and eat fruits only in the night. They are of small size, the body being about a foot long, and the tail fourteen inches, and are thickly clothed with grey and brown fur, similar in substance to that of the Rabbit. Their physiognomy reminds one of an Owl, or Tiger-Cat. The face is round, and encircled by a ruff of whitish fur; the muzzle is not at all prominent. The mouth and chin are small, the ears are very short, scarcely appearing above the hair of the head. The eyes are very large, and yellowish in colour, imparting the staring expression of nocturnal animals of prey. The forehead is whitish, and decorated with three black stripes, which in one of the species (*Nyctipithecus trivirgatus*)

RED-FOOTED DOUROUCOULI. (From the *Proceedings of the Zoological Society.*)

continue to the crown, and in the other (*N. felinus*) meet on the top of the forehead. *N. trivirgatus* was first described by Humboldt, who discovered it on the banks of the Cassiquiare, near the head waters of the Rio Negro. One cannot help being struck by this curious modification of the American type of Monkeys, for the Owl-faced Night Apes have evidently sprung from the same stock as the rest of the Cebidæ, as they do not differ much in all essential points from the Whaiapurais (*Callithrix*), and the Sia-miûs (*Chrysothrix*). They have nails of the ordinary form on all their fingers, and semi-opposable thumbs; but the molar teeth, contrary to what is usual in the Cebidæ, are studded with sharp points, showing that their food is principally insects. I kept a pet animal of the *N. trivirgatus* for many months, a young one being given me by an Indian companion, as a present from my newly-baptised godson. These Monkeys, although sleeping by day, are aroused by the least noise, so that when a person passes by a tree on which a number of them are concealed, he is startled by the sudden apparition of a group of little striped faces crowding a hole in the trunk. It was in this way that my companion discovered the colony from which the one given to me was taken. I was obliged to keep my pet chained up; it therefore never became thoroughly familiar. I once saw, however, an individual of

the other species (*N. felinus*), which was most amusingly tame. It was as lively and nimble as the Cebi, but not so mischievous, and far more confiding in its disposition, delighting to be caressed by all persons who came into the house; but its owner, the municipal judge of Ega (Dr. Carlos Mariani), had treated it for many weeks with the greatest kindness, allowing it to sleep with him at night in his hammock, and to nestle in his bosom half the day as he lay reading. It was a great favourite with every one, from the cleanliness of its habits and the prettiness of its features and ways. My own pet was kept in a box, in which was placed a broad-mouthed glass jar. Into this it would dive, head foremost, when any one entered the room, turning round inside, and thrusting forth its inquisitive face an instant afterwards to stare at the intruder. It was very active at night, venting at frequent intervals a hoarse cry, like the suppressed barking of a Dog, and scampering about the room, to the length of its tether, after Cockroaches and Spiders. In climbing between the box and the wall, it straddled the space, resting its hands on the palms and tips of the outstretched fingers, with the knuckles bent at an acute angle, and thus mounted to the top with the greatest facility. Although seeming to prefer insects, it ate all kinds of fruit, but would not touch raw or cooked meat, and was very seldom thirsty. I was told by persons who had kept these Monkeys loose about the house, that they cleared the chamber of Bats, as well as insect vermin. When approached gently, my Ei-á allowed itself to be caressed, but when handled roughly it always took alarm, biting severely, striking out with its little hands, and making a hissing noise like a Cat. As already related, my pet was killed by a jealous Caiarára Monkey, which was kept in the house at the same time."

THE RED-FOOTED DOUROUCOULI.*

This night-loving Monkey has short hair, and a cylindrical tail, and looks like one of the Lemurs. It has rufous hands and feet, the ear-conchas are large and prominent, and almost hairless. It inhabits Nicaragua.

Another species† is quite nocturnal in its habits, coming out after dark only in search of food in the Peruvian valleys.

THE SAKIS.‡

Humboldt was much impressed with the resemblance of some of these Monkeys in the face to man. One of them, the Capuchin of the Orinoco, is certainly strangely human in its appearance. The eyes have, according to Broderip, a mingled expression of melancholy and fierceness. There is a long, thick beard, and as this conceals the retreating chin, the face and forehead are much upon a line. Strong, active, and fierce, he is tamed with the greatest difficulty, and when angered he raises himself on his hinder extremities, grinds his teeth in his wrath, and leaps around his antagonist with threatening gestures. "If any malicious person wishes to see this Homunculus," writes that entertaining author, "in a most devouring rage, let him wet the Capuchin's beard, and he will find that such an act is an unforgivable sin." It is so anxious not to wet this fine ornament to its face, that instead of putting the mouth to the stream when it desires to drink, it lifts the water in the hollow of its hand, inclines its head on its shoulder, and, carrying the draught to its mouth, drinks slowly, and with deliberation. This Saki is called *Pithecia cheiropotes* (the Hand-drinking Monkey). Its length, including the bushy tail, is about two feet nine inches. It is of a brownish-red colour, and the hair of the forehead is directed forwards. The body hair is long, and the beard, which arises below the ears, is brown, inclining to black, and it covers the upper part of the breast. The back is red, the eyes are sunken, and the nails are, with the exception of those of the thumbs, more like claws. They are very solitary, and often are found without their mates.

This Saki has, in common with many others, certain structural peculiarities which group them all in the genus *Pithecia*. For instance, the incisor or front teeth are rather prominent obliquely, and the lower are long. The canine teeth are long, thick, and cone-shaped. The crushing, or molar teeth, are small. The tail is very hairy, and the ears are large. The ribs are broader relatively in this genus than in any other of the Monkeys.

* *Nyctipithecus rufipes.* † *Nyctipithecus oscryi.* ‡ *Pithecia.*

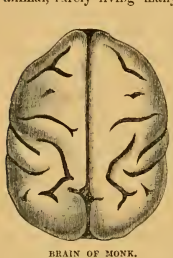
As has already been noticed, the tail differs in length in different members or species of this genus, and consequently it has been divided into a long-tailed and a short-tailed set. The Monkey just mentioned belongs to the long-tailed series, as does also the following :—

THE COUXIO.*

This Saki has a beard under its chin, and the fur is generally of a brown-black in the male, and brown in the female. It has a fine fiery tail, and a very human aspect. The name is by no means satisfactory, especially as by a curious mistake the young ones have been called "Israelites."

THE PARAUACÚ—THE HAIRY SAKI.†

Bates gives the following description of this Monkey, whose habits he studied on the Upper Amazon, at Ega :—"One of the Ega Monkeys is called the Parauacú, and is a timid, inoffensive creature, with a long bear-like coat of harsh speckled-grey hair. The long fur hangs over the head, half concealing the pleasing, diminutive face, and clothes also the tail to the tip, which member is well developed, being eighteen inches in length, or longer than the body. The Parauacú is a very delicate animal, rarely living many weeks in captivity; but any one who succeeds in keeping it alive for a month or two gains by it a most affectionate pet. One of the specimens of *Pithecia albicans*—which is only a variety of this species—now in the British Museum was, when living, the property of a young Frenchman, a neighbour of mine at Ega. It became so tame in the course of a few weeks that it followed him about the streets like a Dog. My friend was a tailor, and the little pet used to spend the greater part of the day seated on his shoulder, whilst he was at work on his board. It showed, nevertheless, great dislike to strangers, and was not on good terms with any other member of my friend's household than himself. I saw no Monkey that showed so strong a personal attachment as this gentle, timid, silent little creature. The eager and passionate Cebi seem to take the lead of all the South American Monkeys in intelligence and docility, and the Coaita has perhaps the most gentle and impressible disposition; but the Parauacú, although a dull, cheerless animal, excels all in this quality of capability of attachment to man. It is not wanting, however, in intelligence as well as moral goodness, proof of which was furnished one day by an act of our little pet. My neighbour had quitted his house in the morning without taking the Parauacú with him, and the little creature having missed its friend, and concluded, as it seemed, that he would be sure to come to me, both being in the habit of paying me a visit daily together, came straight to my dwelling, taking a short cut over gardens, trees, and thickets, instead of going the roundabout way of the street. It had never done this before, and we knew the route it had taken only from a neighbour having watched its movements. On arriving at my house and not finding its master, it climbed to the top of my table, and sat with an air of quiet resignation waiting for him. Shortly afterwards my friend entered, and the gladdened pet then jumped to its usual perch—on his shoulder."



BRAIN OF MONK.
(From the *Proceedings of the Zoological Society.*)

THE MONK.‡

This Monkey is introduced here with a view of explaining the general characteristics of the brain of the group.

The brain of one of these Monkeys weighed 460 grains, or the one-eighteenth part of an entire but emaciated body. The general form is a regular arch, and the cerebellum is covered by the brain proper. Its general form is like that of some of the Cebi, and is less pointed than that of the Old World Apes in front, and less elongated and depressed than those of the lowest Monkeys of the New World, such as the marmosets and Tamarins, for instance.

* *Pithecia Satanas.* † *Pithecia hirsuta.* ‡ *Pithecia monachus.*

On the outer surface of the brain there are few but deeply-cut and characteristic furrows. The fissure of Sylvius slopes backwards and upwards, but not very far back, and ends abruptly. On the front lobe there is a deeply-marked fissure, running crossways, backwards, and outwards, and bent in the middle. Separated from this by a wide interval is the fissure of Rolando. The external perpendicular fissure so common in the Old World Monkeys is just visible. On the inner surface the sulci are present in a simple form, and the calcarine sulcus is well curved, and prolonged and bifurcated. This is a better organised brain than that of the Howler, and is not unlike that of the Spider Monkey.

MONK. (From the *Proceedings of the Zoological Society*.)

The second series of the Sakis, or those with only a short tail, or a stump of three inches in length, are called Brachyures, from this peculiarity.

THE SCARLET-FACED, OR WHITE-SKINNED SAKI. THE UAKARI, AND THE BALD-HEADED BRACHYURE, OR SAKI.*

These are the names of a rare Monkey, which Bates described as follows:—"Early one sunny morning, in the year 1855, I saw in the streets of Ega a number of Indians, carrying on their shoulders down to the port, to be embarked on the Upper Amazon steamer, a large cage, made of strong lianas, some twelve feet in length and five in height, containing a dozen Monkeys of the most grotesque appearance. Their bodies (about eighteen inches in height, exclusive of limbs) were clothed from neck to tail with very long, straight, and shining whitish hair. Their heads were nearly bald, owing to the very short crop of thin grey hairs, and their faces glowed with the most vivid scarlet hue. As a finish to their striking physiognomy, they had bushy whiskers of a sandy colour, meeting under the chin, and

* *Pithecia, or Brachyurus calvus.*

reddish-yellow eyes. They sat gravely and silently in a group, and altogether presented a strange spectacle. These red-faced Apes belonged to a species called by the Indians Vikarof, which is peculiar to the Ega district, and they had been obtained with great difficulty in the forests which cover the low lands, near the principal mouth of the Japura, about thirty miles from Ega. It was the first time I had seen this most curious of all the South American Monkeys. I afterwards made a journey to the district inhabited by it, but did not then succeed in obtaining specimens; before leaving the country, however, I acquired two individuals, one of which lived in my house for several weeks.

"The Scarlet-faced Monkey lives in forests which are inundated during a great part of the year.

COUXIO. (From the *Proceedings of the Zoological Society.*)

It is never known to descend to the ground; the shortness of its tail is therefore no sign of terrestrial habits, as it is in the Macaques and Baboons of the Old World. It differs a little from the typical Cebidæ in its teeth, the incisors being oblique, and in the upper jaw converging, so as to leave a gap between the outermost and the canine teeth. Like the rest of its family, it differs from the Monkeys of the Old World, and from man, in having an additional grinding tooth (pre-molar) on each side of both jaws, making the complete set thirty-six, instead of thirty-two, in number. This Uakari (*Brachyurus calvus*), also called the White Uakari, from its skin, seems to be found in no other part of America than the district just mentioned, namely, the banks of the Japura, near its principal mouth; and even there it is confined, as far as I could learn, to the western side of the river. It lives in small troops amongst the crowns of the lofty trees, living on fruits of various kinds. Hunters say it is pretty nimble in its motions, but is not much given to leaping, preferring to run up and down the larger boughs in travelling from tree to tree. The mother, as in other species of the Monkey order, carries her young on her back. Individuals are obtained alive by shooting them with the blow-pipe, and arrows tipped with diluted Urari poison. They run a considerable distance after being pierced, and it requires an experienced hunter to track them. He is considered the most expert who can keep pace with a wounded one, and

catch it in his arms when it falls exhausted. A pinch of salt (the antidote to the poison) is then put in its mouth, and the creature revives. The species is rare, even to the limited district which it inhabits. Senikor Chrysostomo sent six of his most skilful Indians, who were absent three weeks before they obtained the twelve specimens already noticed. When an independent hunter obtains one, a very high price (thirty or forty milreis—£3 7s. to £4 13s.) is asked, these Monkeys being in great demand for presents to persons of influence down the river. Adult Uakaries caught in the way just described very rarely become tame. They are peevish and sulky, resisting all attempts to coax them, and biting any one who ventures within reach. They have no particular cry, even when in their native woods. In captivity they are quite silent. In the course of a few days, or weeks, if not very carefully attended to, they fall into a listless condition, refuse food, and die. Many of them succumb to a disease which, I supposed from the symptoms, to be inflammation of the chest or lungs. The one which I kept as a pet died of this disorder after I had had it about three weeks. It lost its appetite in a very few days, although kept in an airy verandah. Its coat, which was originally long, smooth, and glossy, became dingy and ragged, like that of the specimens seen in museums; and the bright scarlet colour of its face changed to a duller hue. This colour, in health, is spread over the features up to the roots of the hair on the forehead and temples, and down to the neck, including the flabby cheeks, which hang down below the jaws. The animal in this condition looks, at a short distance, as though some one had laid a thick coat of red paint on its countenance. The death of my pet was slow; during the last twenty-four hours it lay prostrate, breathing quickly, its chest strongly heaving. The colour of its face grew gradually paler, but was still red when it expired. As the hue did not quite disappear until two or three hours after the animal was quite dead, I judged that it was not exclusively due to the blood, but partly to a pigment beneath the skin, which would probably retain its colour a short time after the circulation had ceased. After seeing much of the morose disposition of the Uakari, I was not a little surprised one day at a friend's house to find an extremely lively and familiar individual of this species. It ran from an inner chamber straight towards me after I had sat down on a chair, climbed my legs, and nestled in my lap, turning round and looking up with the usual Monkey's grin after it had made itself comfortable. It was a young animal, which had been taken when its mother was shot with a poisoned arrow. Its teeth were incomplete, and the face was pale and mottled, the glowing scarlet hue not supervening in these animals before mature age; it had also a few long black hairs on the eyebrows and lips. The frisky little fellow had been reared in the house amongst the children, and allowed to run about freely, and took its meals with the rest of the household. There are few animals which the Brazilians of these villages have not succeeded in taming. I have even seen young Jaguars running loose about a house, and treated as pets. The animals that I had rarely became familiar, however long they might remain in my possession, a circumstance due, no doubt, to their being kept always tied up. The Uakari is one of the many species of animals which are classified by the Brazilians as 'mortal,' or of delicate constitution, in contradistinction to those which are 'duro,' or hardy. A large proportion of the specimens sent from Ega die before arriving at Para, and scarcely one in a dozen succeeds in reaching Rio Janeiro alive. It appears, nevertheless, that an individual has once been brought in a living state to England, for Dr. Gray relates that one was exhibited in the gardens of the Zoological Society in 1849. The difficulty it has of accommodating itself to changed conditions probably has some connection with the very limited range or confined sphere of life of the species in its natural state, its native home being an area of swampy woods, not more than about sixty square miles in extent, although no permanent barrier exists to check its dispersal, except towards the south, over a much wider space. When I descended the river in 1859 we had with us a tame adult Uakari, which was allowed to ramble about the vessel, a large schooner. When we reached the mouth of the Rio Negro we had to wait four days, whilst the Custom-house officials at Barra, ten miles distant, made out the passports for our crew, and during this time the schooner lay close to the shore, with its bowsprit secured to the trees on the bank. Well, one morning Scarlet-face was missing, having made his escape into the forest. Two men were sent in search of him, but returned, after several hours' absence, without having caught sight of the runaway. We gave up the Monkey for lost, until the following day, when he re-appeared on the skirts of the forest, and marched quietly down the bowsprit to his usual place on deck. He had evidently found the forests of the Rio Negro very different from those of the delta lands of the Japura, and preferred captivity to freedom in a place that was so uncongenial to him."

THE BLACK-HEADED SAKI.*

This, like the last, must be enumerated among the more remarkable Monkeys of the New World, from all of which it is to be immediately distinguished by the extreme shortness of the tail, a structure which would seem to make it the representative of the Baboons of the Old Continent. It is, in fact, the only one hitherto discovered in America whose tail does not exceed three inches in length. It is altogether a small species, that described by Humboldt measuring little more than one foot five inches from the head to the feet. In its adult state, however, it is described as reaching the length of another foot. Its disposition is inactive, phlegmatic, but very docile. It eats with avidity all sorts of fruits—sweet or sour. These it will seize by stretching out both hands at once, bending the back and body at

WHITE-HEADED SAKI.

the same time in a forward attitude. The physiognomy has a much more human expression than that of the generality of Monkeys, particularly in the face, which is naked and black. Its profile is not much unlike the Ethiopian. The head is oval, but flattened on the sides. On the eyelids, mouth, and chin there are a few stiff hairs, but the chin has no beard. The ears are large, and like those of the human subject, are naked. The fur is long, shining, and of a uniform yellowish-brown colour over the whole of the body. The fingers are much lengthened, the nails rather flat; and the tail, notwithstanding its shortness, is thick, and almost naked towards its extremity. Broderip compares its face to one of the old withered negroes, who, by great respectability of conduct, have gained their freedom. Another variety is the White-headed Saki,† of which we give an illustration.

* *Pithecia melanocephala.* † *Pithecia leucocephala.*

COMMON MARMOSETS.

CHAPTER XII.

THE MARMOSETS AND TAMARINS.*

The Dentition of the Genus Hapale, or the Marmosets, or Ouistitis—The Face—The Paw-like Hands and Feet—Their Claws—The Skull and Brain, and the Nature of the Diet—The Common Marmoset—Its Habits—The Cloaked Marmoset—The Genus Midas—The Tamarins—Their Dentition—The Negro Tamarin—Its Habits—Midas Argentatum—Deville's Midas—The Silky Tamarin—Notes on the Arctopithecini in general.

The second division of the Monkeys of the New World is characterised by there being thirty-two teeth, and the tail is not prehensile. It is generally termed that of the Marmosets, or in scientific language, the Arctopithecini, a word which means Bear-Monkey. There are two genera in this division: the first is that of the Marmosets proper, or genus Hapale; and the second is that of the Tamarins, or genus Midas.

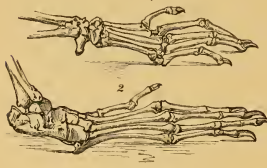
THE MARMOSETS, OR OUISTITIS.†

In this genus the thirty-two teeth are so arranged that instead of there being three back teeth, or true molars, on the side of each jaw, they have only two. But there are three false molars placed in front of these two crushing molars, and this has a direct relation to the insectivorous diet of the animal. The outer edge of these false molars has one sharp point, admirably adapted to pierce a

* *Arctopithecini.* † *Hapale.*

hard-coated Beetle, or to smash up a grub. The incisor, or front teeth, differ in the two genera. They are long (especially the lower ones), narrow, and are curved outwards, and they stick out forwards from the jaw in the genus Hapale. Those of the Tamarins are short and broad, the lower ones being stuck out and close together. The lower canine teeth of the Hapale, or Ouistitis, are very small, and those of the other genus are larger.

The face of the Marmoset is short, and the broad division between the nostrils, which open widely apart and outwards, is very evident. Very remarkable are the feet, for in these Monkeys the toe-thumb is not widely separated from the other digits, but is close to and parallel with them, so that they resemble the human foot more than the human hand. The insectivorous and carnivorous propensities of these little creatures are shown in the form of their nails, which are claws. They are curved, compressed from side to side, and sharp, except that of the great toe, which is broad. In the hand the thumb is not capable of being separated widely from the other fingers, and it has a sharp claw on it, so the resemblance to a true hand is small, and the likeness to a "paw" is great; and to conclude this part of the subject, the soles are much longer than the toes. Hence, with paws and long feet with claws, these little creatures, which have been termed Hapale—from ἁπαλός (soft, gentle)—are not unlike Bears in their extremities, and have been called Bear-Monkeys, or *Arctopithecini*. The intelligence of these Monkeys is certainly not very great, hence the examination of their brain is sure to be interesting, for one would expect that it could not be like that of the intelligent Cebus, or even that of the Spider Monkey. The mouth appears to be large, and it really has a wide gape.



1. HAND-BONES OF MARMOSET.
2. FOOT-BONES OF MARMOSET.

First, then, the skull is remarkable for the relative size of the brain-case, and the back part projects far behind. The outside of the skull is smooth and rounded, and the brow-ridges are very slight, the orbits being large. Inside, and accommodating itself to this long head, is a very long brain, whose back part projects past the cerebellum. But this is not all the unusual part of it, for instead of there being convolutions, or packings-in of the surface of the brain, it is almost smooth, the great fissures being alone marked. Here, then, is the lowest form of brain yet noticed in the Quadrumana, and it approaches to the form seen in the lower animals. What the great back part of the brain-case means is hardly yet known, but if it refers to the affections it will render the story told by Broderip all the more valuable. He says that a lady kept two of these Marmosets, and that she was impressed with their great affection for each other. "They had no family, but they were very happy, and were all in all to each other. One of them unfortunately died. The other seemed to be unwilling to believe the change that had taken place, and continued to caress the body, until it became absolutely necessary to remove it. Everything was done to console the widow that its fond and distressed mistress could think of, but as soon as its mate was taken away the poor widowed creature pressed its little hands to its eyes, refused to be comforted, and remained pining in that attitude till death relieved it of its sufferings."

The teeth and claws indicate a carnivorous or insectivorous diet in these Monkeys, and the brain does not deny it, and many anecdotes may be told of their love of something alive. Every one may see the Marmosets at the Zoological Gardens making usually very successful dashes at flies with their fingers, and enjoying their tiny prey; and there is little doubt that the following story is true:—One of them, which was kept by the "Sage Femme" of the Royal Family about a hundred years since, took a great fancy to fish, and made a dash at a Goldfish he saw swimming round and round in its globe. He caught it, and ate it, so the lady observing his fondness for something lively gave him an Eel, and as the little Monkey was not more than eight or nine inches in length without his tail, this lively gift frightened him at first by twisting round his body and neck; but he soon killed it, and enjoyed the treat.

THE COMMON MARMOSET.*

These little, gentle, pretty creatures, usually so readily tamed, are made great pets of, and attract much attention in all collections of animals, and one kind has been often brought from the tropical woods of the Brazils and kept in England, so that its habits during captivity have been watched from birth until death in adult age. Many years since F. Cuvier had some of the common Marmosets born whilst under his care, and he watched them and their parents well. The young ones had their eyes open on coming into the world, and their skins were covered with very smooth hair of a deep grey colour, but which was scarcely perceptible on the tail. They instantly crept into their mother's nice warm fur, and clung on with their little hands and feet, and they attracted the intense admiration and curiosity of the father and mother, who were in the same cage. There were three little ones, and the mother indeed did not know what to do with them. Broderip suggests that what followed was because the lady Ouistiti had no experienced female friend to direct her in her first confinement. At any rate, the mother seized the first by the head, and proceeded to bite this important part of the body off, and, luckily for the other two, whilst she was thus finishing off her offspring, they managed to get to her breasts, and to begin to suck. From that moment she bestowed upon them the natural attention of a parent, and became all affection. The father was even more affectionate than the mother, and assisted most assiduously in the nursing department. The favourite position of the young ones was upon the back and bosom of the mother, and when she was tired of nursing she would come up to her mate with a shrill cry, which Broderip writes said as plainly as any one could speak, "Here, do take the children!" He immediately stretched forth his hands, and placed the little ones on his back, or under his body, where they held on whilst he carried them about, and amused them. At last they used to get hungry, and whined for their mother, who took them, and after having nursed them returned them to their "papa." In fact, the father did all the hard work, and the mother merely fed them. In this instance this domestic happiness was cut short, for the mother was weakly, no wet-nurse was to be had, and the little ones sank and died. In their native state they lead an arboreal life, and assemble in groups of six or seven, climbing up the tallest trees, and jumping from bough to bough, showing the greatest activity, like and greater than that of Squirrels. So rapidly do they move from branch to branch, and from tree to tree, that the eye fails to follow them readily. They are recognised at once by their long tuft of whitish hair, which sticks out from the side of the head, and almost hides the ears. The size of the whole animal is about that of a small Squirrel, and the tail is very long, bushy, and prettily marked with alternate rings of ash-colour and of black fur. The head is small, the eyes are gentle-looking, and the nose is flat, the face being black. The fur of the body is darkish brown, with different shades of colour for each hair, which is dusky at its root, reddish in the middle, and grey at the tip. There are very different stories told regarding their intelligence and affection. Some naturalists assert that they are incapable of affection towards man, even to the hand that feeds them. Swainson says "it mistrusts all, and treats as indifferently those whom one would think it well knew and those who are strangers; neither does it show much intelligence, although it is attentive, and suspicious of everything that is passing. When under the influence of fear it strives to conceal itself, uttering a short but piercing cry; at other times it hisses." The name Ouistiti has been given to this Monkey, and the Portuguese of the Amazon districts called it the Sanglain, whilst Europeans term it a Marmoset.

THE CLOAKED MARMOSET.†

The word "humerale" is to be translated a part of the harness on the shoulders, or a graduate's cloak, according to an old Latin dictionary, and thus far a fit name has been given to a little Monkey thus noticed by Mr. Bates in his work on the Amazons:—

"I saw in the woods on one occasion a small flock of Monkeys. They belonged to a very pretty and rare species, a kind of Marmoset, I think the *Hapale humeralifer* described by Geoffroy St. Hilaire. I did not succeed in obtaining a specimen, but saw a living example afterwards in the possession of a shopkeeper, at Santarem. It seems to occur nowhere else except in the dry woods

* *Hapale Jacchus.* † *Hapale humeralifer.*

bordering the campos in the interior parts of Brazil. The colours of its fur are beautifully varied; the fore part of the body is white, with the hands grey; the hind part black, with the rump and underside deadish-tawny; the tail is banded with grey and black. Its face is partly naked, and flesh-coloured, and the ears are fringed with long hairs. The specimen was not more than eight inches in length, exclusive of the tail. Altogether I thought it the prettiest species of its family I had yet seen. One would mistake it at first sight for a kitten, from its small size, varied colours, and the softness of its fur. It was a most timid creature, screaming and biting when any one attempted to handle it. It became familiar, however, with the people of the house a few days after it came into their possession. When hungry or uneasy it uttered a weak, querulous cry, a shrill note, which was sometimes prolonged so as to resemble the stridulation of a Grasshopper."

THE TAMARINS.*

The Tamarins have the upper front teeth placed close together; and the lower, which are broad and truncated, project forwards. The lower canines are longer and larger than in the Marmosets. Living in the forests of the Isthmus of Panama, Peru, and of the Brazils, they sometimes collect in troops. They are very restless, active, and probably indulge in a very mixed diet of fruit, eggs, insects, and small birds. The smaller they are the more violent are they in their gesticulations and rage. They appear, when annoyed, bristling up their hair in a very fierce manner. They are, however, easily tamed, and are made great pets of by the natives.

THE NEGRO TAMARIN.†

Bates gives some interesting details regarding the little Midas, or Tamarin Monkeys, which he saw during his long residence on the Amazons. He writes :—

"They are small in size, and more like Squirrels than true Monkeys in their manner of climbing. The nails, except those of the hind thumbs, are long and claw-shaped, like those of Squirrels, and the thumbs of the fore extremities, or hands, are not opposable to the other fingers. I do not mean to convey that they have a near relationship to Squirrels, which belong to the Rodents, an inferior order of Mammals; their resemblance to those animals is merely a superficial one. The body is long and slender, clothed with soft hair, and the tail, which is nearly twice the length of the trunk, is not prehensile. The hind limbs are much larger in volume than the anterior pair. The *Midas ursulus* is never seen in large flocks; three or four is the greatest number observed together. It seems to be less afraid of the neighbourhood of man than any other Monkey. I sometimes saw it in the woods which border the suburban streets, and once I espied two individuals in a thicket behind the English Consul's house at Nazareth. Its mode of progression along the main boughs of the lofty trees is like that of the Squirrels; it does not ascend to the slender branches, or take wonderful flying leaps like those Monkeys whose prehensile tails and flexible hands fit them for such headlong travelling. It confines itself to the larger boughs and trunks of trees, the long nails being of great assistance to the creature, enabling it to cling securely to the bark, and it is often seen passing rapidly round the perpendicular cylindrical trunks. It is a quick, restless, timid little creature, and has a great share of curiosity, for when a person passes by under the trees along which a flock is running, they always stop for a few moments to have a stare at the intruder. In Para, the *Ursulus* is often seen in a tame state in the houses of the inhabitants. When full grown it is about nine inches long, independently of the tail, which measures fifteen inches. The fur is thick, and black in colour, with the exception of a reddish-brown streak down the middle of the back. When first taken, or when kept tied up, it is very timid and irritable. It will not allow itself to be approached, but keeps retreating backwards in a querulous humour, uttering a twittering, complaining noise, its dark, watchful eyes, expressive of distrust, observant of every movement which takes place near it. When treated kindly, however, as it generally is in the houses of the natives, it becomes very tame and familiar. I once saw one as playful as a kitten, running about the house after the negro children, who fondled it to their hearts' content. It acted somewhat differently towards strangers, and seemed not to like them to sit on the hammock which was slung in the room, leaping up, trying to bite, and otherwise annoying them. It is generally fed on

* *Midas.* † *Midas ursulus.*

sweet fruits, such as the banana, but it is also fond of insects, especially soft-bodied Spiders and Grasshoppers, which it will snap up with eagerness when within reach. The expression of countenance in these small Monkeys is intelligent and pleasing. This is partly owing to the open facial angle which is given as one of 60° ; but the quick movements of the head, and the way they have of inclining it on one side when their curiosity is excited, contribute very much to give them a knowing expression. Anatomists who have dissected species of Midas tell us that the brain is of a very low type, from there being few convolutions, the surface being as smooth as that of a Squirrel's. I should conclude, at once, that this character is an unsafe guide in judging on the mental qualities of these animals. In mobility of expression of countenance, intelligence, and general manners, these small Monkeys resemble

DEVILLE'S MIDAS. (From the *Proceedings of the Zoological Society.*)

the higher Apes far more than they do any rodent animal with which I am acquainted. On the Upper Amazon I once saw a tame individual of the *Midas leoninus*, a species first described by Humboldt, which was still more playful and intelligent than the one just described. This rare and beautiful little Monkey is only seven inches in length, exclusive of the tail. It is named *leoninus* on account of the long brown mane which depends from the neck, and which gives it very much the appearance of a diminutive Lion. In the house where it was kept it was familiar with every one ; its greatest pleasure seemed to be to climb about the bodies of different persons who entered. The first time I went in it ran across the room straightway to the chair on which I sat down, and climbed up to my shoulder. Arrived there it turned round and looked into my face, showing its little teeth, and chattering, as though it would say, 'Well, and how do you do?' It showed more affection towards its master than towards strangers, and would climb up to his head a dozen times in the course of an hour, making a great show every time of searching there for certain animalculæ. Isidore Geoffroy St. Hilaire relates of a species of this genus, that it distinguished between different objects depicted on an engraving. M. Audouin showed it the portraits of a Cat and a Wasp. At these it became much terrified ; whereas,

at the sight of a figure of a Grasshopper or Beetle, it precipitated itself on the picture, as if to seize the objects there represented."

MIDAS ARGENTATUM.

Bates is the authority for the following short notice of this pretty Monkey:—"The little Tamarin is one of the rarest of the American Monkeys. I have not heard of its being found anywhere except near Cameta. I once saw three individuals together running along a branch in a cacao grove near Cameta. They looked like white kittens. In their motions they resembled precisely the *Midas ursulus* already described. I saw afterwards a pet animal of this species, and heard that there were many so kept, and that they were esteemed as choice treasures. The one I saw was full-grown, but it measured only seven inches in length of body. It was covered with long white silky hairs, the tail was blackish, and the flesh nearly naked and flesh-coloured. It was a most timid and sensitive little thing. The woman who owned it carried it constantly in her bosom, and no money would induce her to part with her pet. She called it 'Mico.' It fed from her mouth, and allowed her to fondle it freely, but the nervous little creature would not permit strangers to touch it. If any one attempted to do so it shrank back, the whole body trembling with fear, and its teeth chattered, whilst it uttered its tremulous frightened tones. The expression of its features was like that of its more robust brother, the *ursulus;* the eyes, which were black, were full of curiosity and mistrust, and it always kept them fixed on the person who attempted to advance towards it."

DEVILLE'S MIDAS.*

This pretty Monkey is plentiful everywhere on the Peruvian Amazons, but is extremely delicate in constitution. It will not bear the least cold, and it is kept with great difficulty. The Indian women make great pets of them, and put them into the long hair on their heads. They are thus kept warm, and are not without interesting occupation. Having become tame they frequently hop out of their odd home and feed, or having captured a Spider or two, scamper back and hide under the luxuriant crop of their owners, who are generally unwilling to part with them.

THE SILKY TAMARIN.†

This is one of the prettiest of the Tamarins, and has long silky fur and soft yellow hair. This is arranged like a mane around the neck and face, near to which its tint is redder than usual, and, to make a contrast, the face itself, and also the hands and feet, are dark purple. The beauty of the hair is very striking, and when the sun shines upon it there is a great display of colour, and a rich gloss over all. Like all the Tamarins, it has a tail about the same length as the body, which is not prehensile, but it is in this instance tufted at the end. The habits are pretty evident when the sharp, claw-like nails are examined. They are admirably adapted for seizing and killing small birds and insects, as well as for assisting the hands to hold fruit.

SKULL OF MARMOSET.

In the Brazilian forests they assemble in small parties, and, like the other Marmosets, bound from tree to tree, and keep up a great chattering and whistling, and they cry out with alarm, and soon disperse on the appearance of man within their usual haunts. This fondness for being high up in the woods is carried into their captivity, where they prefer having their little nest up at the top of the cage. In descending from this favourite spot they usually climb down backwards, the tail hanging down. They do not try to stand erect, and, indeed, the position is not natural to them.

They like to be caressed and fondled, but they give no such return, and they know those who are kind to them. They dislike strangers usually, and hiss at them. They are very delicate in Europe, as they require a constant high temperature. Cuvier states that these Monkeys have an air sac in the throat, resembling in situation that of the Spider Monkey (*Ateles paniscus*).

The Arctopithecini, as a group, have a smooth and rounded skull, large orbits, small brow-ridges, and a large brain-case. The skull is large behind, and the opening for the spinal cord (foramen magnum) is at

* *Midas Devillii.* † *Midas rosalia.*

the junction of the hind third with the two fore thirds of the length of the brain. They have numerous vertebræ in their back-bone, and those in the back and loins number usually nineteen. It is stated by Cuvier that there is an air sac in the neck of the *Midas ursulus*, which communicates with the organ of voice through a space between two of its cartilages. It appears that the hands and feet of the Marmosets have thumbs and toe-thumbs so slightly separable from the fingers and toes that the resemblance to "feet" is decided. This is increased by the fact that the thumbs have claws on them, and the toe-thumb is the only digit with a flat nail, all the rest having claw-like ones. The thumb is really not opposable, but nevertheless the muscles are there to give it movement; the opponens muscle of the thumb is doubtfully present, but the adductors, abductor, and long and short flexors are all there. There is much union of the deeper muscles of the fingers, indicating less independence of movement. In the foot the toe-thumb has no special abductor, and the transversus pedis is absent.

CHAPTER XIII.

GENERAL REMARKS ON THE QUADRUMANA.

The Classification of the Monkeys of the New World—The Geographical Distribution of the Genera—The Fossil Monkeys of the New and Old World and their Alliances—The former old Fauna of Europe, Asia, and Africa—The Resemblance of Quadrumana to other Animals and Man.

With regard to the Monkeys of the New World, they are to be grouped and classified as follows:—The Howlers must be placed by themselves, then the Spider Monkeys; the Lagothrix and the Sajous form a very distinct group; and thus the prehensile-tailed series is complete. Then come the non-prehensile-tailed. The Sakis form one group, and the Squirrel Monkeys, and the Night, or Owl Monkeys (the Douroucoulis), make a second. The Arctopithecini are another family, and consist of the Marmosets and Tamarins.

Family.	*Sub-Family.*	*Genus.*	*Example.*
Platyrhini, or Cebidæ	Prehensile-tailed	Mycetes	Howler.
		Ateles	Spider Monkey.
		Lagothrix	Barrigudo.
		Cebus	Cai.
	Non-prehensile-tailed	Pithecia, including Brachyurus	Saki.
		Callithrix	Squirrel Monkey.
		Nyctipithecus	Douroucouli.
Arctopithecini		Hapale	Marmosets.
		Midas	Tamarins.

The American Monkeys present some remarkable instances of the localisation and dispersion of species; allied kinds of different species, but with the same habits, occupying neighbouring districts, or being rather remote. And it is noticed that the great rivers form barriers between the homes of different kinds, which, however, mingle at the river source, and in the country not rendered impassable to them by broad streams. Thus Wallace noticed that the Howler (*Mycetes Beelzebub*) is apparently confined to the Lower Amazon, in the vicinity of Para, and a black species to the Upper Amazon, the Red Ursine Howler having the Rio Negro and the Upper Amazon as its forest ground.

One Spider Monkey is found only in the Guiana district north of the Amazons, and another, the *Ateles ater*, inhabits West Brazil, but the species of the genus range, as a whole, over the forest regions from the south of Mexico to 30° south latitude, and even on the west of the Andes.

The Lagothrix Monkeys, with their fine, furry coats, are found in the Ecuador district of the

Amazons, but are unknown in Guiana and Eastern Brazil, and the species of the short-tailed Sakis are restricted to special districts; thus the Couxio is from Guiana, and does not pass the Rio Negro on the west, or the Amazon on the south. The white-skinned one is found on the Rio Negro, and the *B. rubicundus* on the Upper Amazon, another species being found on the lower part of the same river. So it is with the other Sakis with long tails. The genus is found widely dispersed, but the species are restricted in their roaming. One is found, according to Wallace, on the north bank of the Upper Amazon, and another, with a red beard, only to the south-west of the Rio Negro. The genus Cebus has a very wide range in South America, so has the Squirrel Monkey group, for they are found on both banks of the Amazon and Rio Negro; but the white-collared species is found only on the Upper Rio Negro, and another on the Upper Amazon.

The same author noticed the range of the Douroucoulis in the Amazon districts; one (*N. trivirgatus*) is found in Ecuador, and the Cat-like kind on the Upper Amazon. Equally restricted to limited districts were three kinds of Marmosets.

Fossil remains of Monkeys have been found in the New World in the Brazils, which belong to the existing genera Cebus, Callithrix, and Hapale. The fossil Cebus is at least four feet in height, and the Callithrix was of a very large kind. The fossil Ouistitis are large and small. The geological age of the Brazilian fossils is probably about that of the last European deposits. Now, the remarkable part of this interesting story is, that in the olden time there was the same division of the Monkeys into those of the Old and of the New World. The Catarhini were then, as now, restricted to Europe, Asia, and doubtless to Africa; and the Platyrhini were only found in America, and moreover the resemblance of the old forms to the new is remarkable, the large size of the fossils being in keeping with what is known about the large dimensions of most of the old forms of life. Rütimeyer's discovery in Switzerland of a fossil with bones like those of the Howler (Mycetes), and yet like a Lemur in structure, and of vast antiquity, carries us back to a time when a different distribution of animals prevailed. Then there were American-looking and Madagascar-looking things in Europe, and associated with them were Opossums and other creatures foreign enough to it at the present time. Nevertheless, this fact gives the hint of the origin of the American Monkeys from the Lemurs. Lately the fossil remains of a Lemur-like animal have been found in North America. In concluding this short notice of the extinct Monkeys, it must be remembered that in the days when there were those agreeable northern climates which made Greenland a land of flowers, Indian Monkeys lived in the dense woods of Greece, Central Europe, and Southern France.

Mr. Darwin, who has collected a vast array of facts relating to the resemblance of the Monkeys to other beings, writes very much as follows:—

"The resemblance of Monkeys to man is greatly caused by the relative position of the features of the face. The eyes are arched over; they are separated by a long nose, the end of which in some is very human. The mouth is not carried back, but occupies the same general position as in man, and the forehead, so often wrinkled, is usually prominent, and like that of a child. The likeness is increased by the fact that anger, sorrow, pleasure, and satisfaction are displayed by the Monkey by nearly similar movements of the muscles and skin, chiefly above the eyebrows, and round the mouth. Some few expressions," writes Mr. Darwin, "are, indeed, almost the same, as in the weeping of certain kinds of Monkeys, and in the laughing noise made by others, during which the corners of the mouth are drawn backwards, and the eyelids wrinkled. In man the nose is much more prominent than in most Monkeys; but," writes the same author, "we may trace the commencement of an aquiline curvature in the nose of the Hoolock Gibbon, and this in the great-nosed Monkey is carried to a ridiculous extreme." All this is disappointing to those who pride themselves on "the family nose," especially if it is a Roman. Again, the faces of many Monkeys are furnished with beards, whiskers, and moustaches. The hair grows to a great length in some species of Semnopithecus, and in the Bonnet Monkey (*Macacus radiatus*) it radiates from a point on the crown, with a parting down the middle. This is a human fashion; moreover, in this Monkey the front hair ends rather abruptly, and a downy and almost smooth-looking forehead is shown. They have eyebrows in some instances. Mr. Darwin, in carrying out his investigations into the resemblances between men and Monkeys, said he is, as, indeed, have been all anatomists, very interested regarding the hair of the limbs of those he places in comparison. "It is well known," he writes, "that the hair on our arms tends to converge from

above and below to a point at the elbow. This curious arrangement, so unlike that in most of the lower Mammals, is common to the Gorilla, Chimpanzee, Orang, some species of Hylobates, and even to some American Monkeys. It is not invariable in the same genus, for in *Hylobates agilis* the hair on the fore-arm is directed downwards, or towards the wrist, in the ordinary manner, and in *Hylobates lar*, it is nearly erect, with only a slight forward inclination. It can," he adds, "hardly be doubted that with most Mammals the thickness of the hair and its direction on the back are adapted to throw off rain, and even the transverse hairs of the Dog's leg may serve for this end when he is curled up asleep."

Mr. Wallace remarks that the convergence of the hair towards the elbow on the arms of the Orang serves to throw off the rain when, as is the custom of this animal, the arms are bent, with the hands clasped round a branch, or over its own head. But the previously-mentioned naturalist aptly remarks

HEAD OF THE BLACK HOWLER. (From the *Proceedings of the Zoological Society.*)

that the attitude may not determine the direction of the hair; and that, on the contrary, the direction of the hair may determine the attitude. Of course the darkness of the negro makes any likeness, real or imaginary, with the Monkey, all the greater, and really the resemblance of the American Monkey—whose name (*Satanas*) indicates his ill looks—with its jet-black skin, white rolling eyeballs, and hair parted at the top of its head, to a young negro, is laughable enough.

Any one who visits the Zoological Gardens soon becomes aware that there is a great variety of expression in the eyes and muscles of the face of Monkeys, and infinitely greater in amount than in any other animals, and in some points infinitely less than in man. Mr. Darwin has collected facts, and given the result of his own observations upon the different methods of expression produced by the facial and other muscles, and the following is from his work on the "Expression of the Emotions":—

"It is not possible to distinguish in Monkeys, at least, without more experience than I have had, the expression of pleasure or joy from that of affection. Young Chimpanzees make a kind of barking noise when pleased by the return of any one to whom they are attached. When this noise—which the keepers call a laugh—is uttered, the lips are protruded; but so they are under various other emotions.

Nevertheless, I could perceive that when they were pleased, the form of the lips differed a little from that assumed when they were angered. If a young Chimpanzee be tickled, and the armpits are particularly sensitive to tickling—as in the case of our children—a more decided chuckling or laughing sound is uttered, though the laughter is sometimes noiseless. The corners of the mouth are then drawn backwards, and this sometimes causes the lower eyelids to be slightly wrinkled. But this wrinkling, which is so characteristic of our own laughter, is more plainly seen in some other Monkeys. The teeth in the upper jaw in the Chimpanzee are not exposed when they utter their laughing noise, in which respect they differ from us; but their eyes sparkle and grow brighter, as Mr. W. L. Martin, who has particularly attended to their expression, states.

"Young Orangs when tickled likewise grin and make a chuckling sound, and Mr. Martin says that their eyes grow brighter. As soon as their laughter ceases, an expression may be detected passing over their faces, which, as Mr. Wallace remarked, may be called a smile. I have also noticed something of the same kind with the Chimpanzee. Dr. Duchenne—and I cannot quote a better authority—informs me that he kept a very tame Monkey in his house for a year, and when he gave it during meal times some choice delicacy, he observed that the corners of its mouth were slightly raised; thus an expression of satisfaction, partaking of the nature of an incipient smile, and resembling that often seen on the face of man, could be plainly perceived in this animal.

"The *Cebus azaræ*, when rejoiced at again seeing a beloved person, utters a peculiar twittering sound. It also expresses agreeable sensations by drawing back the corners of its mouth, without producing any sound. Rengger calls this movement laughter, but it would be more appropriately called a smile. The form of the mouth is different when either pain or terror is expressed, and shrill shrieks are uttered. Another species of Cebus in the Zoological Gardens when pleased makes a reiterated shrill note, and likewise draws back the corners of its mouth, apparently through the contraction of the same muscles as with us. So does the Barbary Ape (*Inuus ecaudatus*) to an extraordinary degree; and I observed in this Monkey that the skin of the lower eyelids then became much wrinkled. At the same time it rapidly moved its lower jaw or lips in a spasmodic manner, the teeth being exposed; but the noise produced was hardly more distinct than that which we sometimes call silent laughter. Two of the keepers affirmed that this slight sound was the animal's laughter, and when I expressed some doubt on this head (being at the time quite inexperienced), they made it attack, or rather threaten, a hated Entellus Monkey living in the same compartment. Instantly the whole expression of the face of the Inuus changed; the mouth was opened much more widely, the canine teeth were more fully exposed, and a hoarse barking noise was uttered.

"The Anubis Baboon was first insulted, and put into a furious rage, as was easily done by his keeper, who then made friends with him, and shook hands. As the reconciliation was effected the Baboon rapidly moved his jaws and lips up and down, and looked pleased. Two or three species of Macacus, and the *Cynocephalus niger*, draw back their ears, and utter a slight jabbering noise when they are pleased by being caressed. With the Cynocephalus the corners of the mouth are at the same time drawn backwards and upwards, so that the teeth are exposed; hence this expression would never be recognised by a stranger as one of pleasure. The crest of long hairs on the forehead is depressed, and apparently the whole skin of the head drawn backwards. The eyebrows are thus raised a little, and the eyes assume a staring appearance. The lower eyelids also become slightly wrinkled, but this wrinkling is not conspicuous, owing to the permanent transverse furrows on the face. With Monkeys the expression of slight pain, or of any painful emotion, such as grief, vexation, jealousy, &c., is not easily distinguished from that of moderate anger, and these states of mind readily and quickly pass into each other. Grief, however, with some species, is certainly exhibited by weeping. A woman who sold a Monkey to the Zoological Society, believed to have come from Borneo (*Macacus maurus*), said that it often cried, and Mr. Bartlett, as well as the keeper, Mr. Sutton, has repeatedly seen it, when grieved, or even when much pitied, weeping so copiously, that the tears rolled down its cheeks. There is, however, something strange about this case, for two specimens subsequently kept in the Gardens, and believed to be the same species, have never been seen to weep, though they were carefully observed by the keeper and myself when much distressed and loudly screaming. Rengger states that the eyes of the *Cebus azaræ* fill with tears, but not sufficiently to overflow, when it is prevented getting some much-desired object, or is much frightened. Humboldt also asserts that

the eyes of the *Callithrix sciureus* instantly fill with tears when it is 'seized with fear,' but when this pretty little Monkey in the Zoological Gardens was teased so as to cry out loudly, this did not occur. I do not, however, wish to throw the least doubt on the accuracy of Humboldt's statement.

"The appearance of dejection in young Orangs and Chimpanzees when out of health is as plain and almost as pathetic as in the case of our children. Their state of mind and body is shown by their listless movements, fallen countenances, dull eyes, and changed complexion.

"This emotion is often exhibited by many kinds of Monkeys, and is expressed, as Mr. Martin remarks, in many different ways. Some species, when irritated, pout the lips, gaze with a fixed and savage glare on their foe, and make repeated short starts as if about to spring forward, uttering at the same time inward guttural sounds. Many display their anger by suddenly advancing, making abrupt starts, at the same time opening the mouth, and pursing up the lips so as to conceal the teeth, while the eyes are daringly fixed on the enemy as if in savage defiance. Some again, and principally the long-tailed Monkeys, or Guenons, display their teeth, and accompany their malicious grins with a sharp, abrupt, reiterated cry. Mr. Sutton confirms the statement that some species uncover their teeth when enraged, whilst others conceal them by the protrusion of their lips, and some kinds draw back their ears. The *Cynocephalus niger*, lately referred to, acts in this manner, at the same time depressing the crest of hair on its forehead, and showing its teeth, so that the movements of the features from anger are nearly the same as those from pleasure; and the two expressions can be distinguished only by those familiar with the animal.

"Baboons often show their passion, and threaten their enemies in a very odd manner, namely, by opening their mouths widely, as in the act of yawning. Mr. Bartlett has often seen two Baboons, when first placed in the same compartment, sitting opposite to each other, and thus alternately opening their mouths; and this action seems frequently to end in a real yawn. Mr. Bartlett believes that both animals wished to show to each other that they are provided with a formidable set of teeth, as is undoubtedly the case. As I could hardly credit the reality of this yawning gesture, Mr. Bartlett insulted an old Baboon, and put him into a violent passion, and he almost immediately thus acted. Some species of Macacus and of Cercopithecus behave in the same manner. Baboons likewise show their anger—as was observed by Brehm with those which he kept alive in Abyssinia—in another manner, namely, by striking the ground with one hand, like an angry man striking the table with his fist. I have seen this movement with the Baboons in the Zoological Gardens, but sometimes the action seems rather to represent the searching for a stone or other objects in their beds of straw. Mr. Sutton has often observed the face of the Rhesus Monkey, when much enraged, growing red. As he was mentioning this to me another Monkey attacked a Rhesus, and I saw its face redden as plainly as that of a man in a violent passion. In the course of a few minutes after the battle the face of this Monkey recovered its natural tint; at the same time that the face reddened, the naked posterior part of the body, which is always red, seemed to grow still redder, but I cannot positively assert that this was the case. When the Mandrill is any way excited the brilliantly-coloured naked parts of the skin are said to become still more vividly coloured.

"With several species of Baboons the ridge of the forehead projects much over the eyes, and is studded with a few long hairs representing our eyebrows. These animals are always looking about them, and in order to look upwards they raise their eyebrows. They have thus, as it would appear, acquired the habit of frequently moving their eyebrows. However this may be, many kinds of Monkeys, especially the Baboons, when angered or in any way excited, rapidly and incessantly move their eyebrows up and down, as well as the hairy skin of their foreheads. As we associate in the case of man raising and lowering of the eyebrows with definite states of the mind, the almost incessant movement of the eyebrows by Monkeys gives them a senseless expression. I once observed a man who had a trick of continually raising his eyebrows with any corresponding emotion, and this gave to him a foolish appearance; so it is with some persons who keep the corners of their mouths a little drawn backwards and upwards, as if by an incipient smile, though at the time they are not amused or pleased.

"A young Orang, made jealous by her keeper attending to another Monkey, slightly uncovered her teeth, and uttering a peevish noise, like 'tish-shist,' turned her back on him. Both Orangs and Chimpanzees when a little more angered protrude their lips greatly, and make a harsh barking noise.

A young female Chimpanzee in a violent passion presented a curious resemblance to a child in the same state. She screamed loudly, with widely-open mouth, the lips being retracted so that the teeth were fully exposed. She threw her arms wildly about, sometimes clasping them over her head. She rolled on the ground, sometimes on her back, sometimes on her belly, and hit everything within reach. A young Gibbon in a passion has been described as behaving in almost exactly the same manner. The lips of young Orangs and Chimpanzees are protruded sometimes to a wonderful degree under various circumstances. They act thus not only when slightly angered, sulky, or disappointed, but when alarmed at anything—in one instance at the sight of a Turtle—and likewise when pleased. But neither the degree of protrusion nor the shape of the mouth is exactly the same, as I believe, in all cases; and the sounds which are then uttered are different.

"Frowning, which is one of the most important of all the expressions in man, is due to the contraction of the corrugations by which the eyebrows are covered and brought together, so that vertical furrows are formed on the forehead. Both the Orang and Chimpanzee are said to possess this muscle, but it seems rarely brought into action, at least in a conspicuous manner. I made my hands into a sort of cage, and placing some tempting fruit within, allowed both a young Orang and Chimpanzee to try their utmost to get it out; but, although they grew rather cross, they showed not a trace of a frown, nor was there any frown when they were enraged. Twice I took two Chimpanzees from their rather dark room suddenly into bright sunshine, which would certainly have caused us to frown. They blinked and winked their eyes, but only once did I see a very slight frown. On another occasion I tickled the nose of a Chimpanzee with a straw, and, as it crumpled up its face, slight vertical furrows appeared between the eyebrows. I have never seen a frown on the forehead of the Orang.

"A fresh-water Turtle was placed, at my request, in the same compartment in the Zoological Gardens with many Monkeys, and they showed unbounded astonishment, as well as some fear. This was displayed by their remaining motionless, staring intently with widely-opened eyes, their eyebrows being often moved up and down. Their faces seemed somewhat lengthened. They occasionally raised themselves on their hind legs to get a better view. They often retreated a few feet, and then, turning their heads over one shoulder, again stared intently. It was curious to observe how much less afraid they were of the Turtle than of a living Snake, which I had formerly placed in their compartment, for in the course of a few minutes some of the Monkeys ventured to approach and touch the Turtle. On the other hand some of the larger Baboons were greatly terrified, and grinned as if on the point of screaming out. When I showed a little dressed-up doll to the black Baboon, it stood motionless, stared intently with widely-opened eyes, and advanced its ears a little forwards; but when the Turtle was placed in its compartment, this Monkey also moved its lips in an odd, rapid, jabbering manner, which the keeper declared was meant to conciliate or please the Turtle. I was never able clearly to perceive that the eyebrows of astonished Monkeys were kept permanently raised, though they were frequently moved up and down. Attention, which precedes astonishment, is expressed by man by a slight raising of the eyebrows, and Dr. Duchenne informs me that when he gave to the Monkey formerly mentioned some quite new article of food, it elevated its eyebrows a little, thus assuming an appearance of close attention. It then took the food in its fingers, and with lowered or rectilinear eyebrows scratched, smelt, and examined it, an expression of reflection being thus exhibited. Sometimes it would throw back its head a little, and again with suddenly-raised eyebrows re-examine, and finally taste, the food.

"In no case did any Monkey keep its mouth open when it was astonished. Mr. Sutton observed for me a young Orang and Chimpanzee during a considerable length of time; and, however much they were astonished, or whilst listening intently to some strange sound, they did not keep their mouths open. This fact is surprising, as with mankind hardly any expression is more general than a widely-open mouth, under the sense of astonishment. As far as I have been able to observe, Monkeys breathe more freely through their nostrils than men do, and this may account for their not opening their mouths when they are astonished, for, as can be discovered with care, man apparently acts in this manner when startled, at first for the sake of quickly drawing a full inspiration, and afterwards for the sake of breathing as quietly as possible.

"Terror is expressed by many kinds of Monkeys by the utterance of shrill screams, the lips being drawn back so that the teeth are exposed. The hair becomes erect, especially when some anger is likewise felt. Mr. Sutton has distinctly seen the face of the Rhesus Monkey grow pale from fear.

Monkeys also tremble from fear, and sometimes they void their excretions. I have seen one which, when caught, almost fainted from an excess of terror."

Rengger, who studied the American Monkeys carefully, says that they evidently understand each others' gestures, and this is plain enough to all who spend a little time in a large collection of them. They have their likes and dislikes, and submit to be teased and bullied by some favourite, although of a different species; the contrary, however, is the usual occurrence, and they resent familiarities very readily. Perhaps the most amusing instance of this fondness is given by Mr. Darwin, who had it from the Superintendent of the Zoological Gardens. Two Chimpanzees, rather older animals than those usually brought to England, were introduced to each other for the first time:—"They sat opposite,

YOUNG ORANGS. (*From a Sketch at the Zoological Gardens.*)

touching each other with their much-protruding lips, and the one put his hand on the shoulder of the other. They then mutually folded each other in their arms. Afterwards they stood up, each with one arm on the shoulder of the other, lifted up their heads, opened their mouths, and yelled with delight."

Mr. Bartlett, of the Zoological Gardens, states that the faculty of attention which is necessary for imitation, obedience, and teaching, is a very variable one amongst the same species of Monkeys, and told Mr. Darwin the following anecdote:—"A man who trains Monkeys to act used to purchase common kinds from the Zoological Society at the cost of five pounds for each, but he offered to give double that price if he might keep three or four of them for a few days, in order to select one. When asked how he could possibly so soon learn whether a particular Monkey would turn out a good actor, he answered that it all depended on their power of attention. If, when he was talking and explaining anything to a Monkey, its attention was easily distracted, as by a fly on the wall, or other trifling object, the case was hopeless. If he tried punishment to make an inattentive Monkey act, it turned sulky. On the other hand, a Monkey which carefully attended to him could always be trained."

Very little is known about the family habits of the Monkey, and whether they have one, two, or

many wives; but in some instances, where the colour of the male and his ornamentation differs from that of the female, it has been possible to trace their habits. Thus, the Gorilla is undoubtedly a polygamist, and the males and females differ. So it is with the Baboons, which live in troops or herds containing twice as many adult females as males. Amongst the South American Monkeys the Howler (*Mycetes caraya*) usually lives with two or three wives, and is distinguished from them by his voice, colour, and beard; and the Capuchin, which also differs from the female, is probably polygamous. The good example of having one wife set by some Monkeys is utterly lost upon some Eastern potentates. Thus, Sir John Lubbock states, that an intelligent Kandyan chief—of course a polygamist—was perfectly scandalised at the utter barbarism of living with only one wife, and never parting until separated by death. "It was," he said, "just like the Wanderoo Monkey." P. MARTIN DUNCAN.

CHAPTER XIV.

THE LEMUROIDA.

THE GENERA INDRIS AND LEPILEMUR HAPALEMUR.

The Name of the Genus Lemur popularly given to the Group—Lemuroida the Correct Name—Their Distinctive Characters—Their Hands and Feet—Ankle-bones—Tail—*Rete Mirabile*—Nostrils—Colour of the Eye—Ears—Teeth—Brain—Resemblance to Monkeys—Their Locality—Lemur at Liberty—Its Playfulness—Division of the Lemurs—Beauties of Madagascar—GENUS INDRIS—Described by Grandidier—Their Locality—Colour—Fingers—Teeth—THE DIADEM INDRIS—Specimens at the British Museum—Little known about it—THE WOOLLY LEMUR—Described by Sonnerat—THE SHORT-TAILED INDRIS—Distinguished by its Tail—Its Skull—GENUS LEPILEMUR—Their Teeth—Tail—THE WEASEL LEMUR—THE GREY LEMUR—Specimens obtained by Pollen—Their Cry.

THE forests of Madagascar, of Western and Eastern Africa, and of some of the Asiatic Islands, are the homes of several kinds of animals which are not unlike the Monkeys in some respects, but which differ from them in their habits of life, and, to a certain extent, in their anatomy. Most of them are in the habit of hiding up all the day, and of moving with great vivacity at dusk and during the night-time. Their gliding, noiseless motion amidst the dense foliage of the tropical woods during the dark hours, and their restless activity in searching for their food during the short twilight, were considered to resemble the fitful apparitions of sprites, spectres, and hobgoblins, and hence Linnæus gave them the name of Lemurs, taking the term from the Latin (*lemures*), "ghosts." The name has been adopted popularly, so as to include all the kinds which, with some structural resemblance to the Monkeys, are for the most part nocturnal in their habits, and it really appears to represent the notions which the excessively timid and superstitious natives of the Eastern Islands have of the malevolent influence of some of these active and very small creatures, whose large eyes glare and shine in the dark woods as they rush to and fro before the extreme darkness of the night commences. The use of the name has been productive of some confusion, for it was especially given to one genus or group of kinds which is restricted to the Island of Madagascar. The genus Lemur, with a species of which most visitors to the Zoological Gardens are familiar—the Ring-tailed Lemur—by no means contains all the animals now under consideration, and they have been arranged under other groups, or genera, and have different names; yet they are all popularly called Lemurs.

Hence, to avoid this confusion, it is usual to call the genus just mentioned genus Lemur, and all the others "Lemur-like animals," and the Greek word εἶδος (*like*) being added the term *Lemuroida* is formed. In scientific language, then, the creatures popularly called Lemurs are termed *Lemuroida*. Either expression may be used, but if the familiar one is employed, it is necessary to remember that the word means other animals besides those of the genus Lemur.

The Lemurs, using the popular term in its wide significance, can be distinguished from the Monkeys and all other animals at a glance. Very few travellers have the opportunity of observing

ANUBIS BABOON. (*See pp.* 149-150.)

(*From the Living Specimen in the Zoological Gardens, London.*)

them when wild, and enjoying their liberty in their native woods, but every visitor to the Zoological Gardens in the Regent's Park may have the chance of comparing some of them with other animals. This comparison may be made readily at certain times, but not always, for only a few Lemurs care to show themselves in broad daylight, and the rest come out of their little nests in the evening. They are known by hairy "hands" at the end of the arms and legs, large furry tails, slim furry bodies, long ears, great staring eyes, and a muzzle like that of a small Fox. At night-time, when the Baboons, Macaques, Guenons, and American Monkeys are at rest and asleep, the Lemurs are awake, and rushing and jumping here and there in their limited space; but during the day-time, when the Monkey world is most giddy, with one or two exceptions the others are quiet, and if poked out into daylight look dazed and stupid, and are only too glad to get into darkness again. The exceptions to these habits are not numerous. The Night-loving Monkey of South America comes out to look about at the same time as its neighbour, the Night-loving Lemur; and the Common, or Ring-tailed Lemur, is always ready to receive food, or to be noticed in broad daylight, as it goes to bed with monkeydom in general.

The other animals with which the Lemuroida may be confounded are such as Squirrels, Weasels, Rats, Cats, and small Kangaroos. Some Lemuroida have a slight resemblance, in general shape, to some of these, and their habit of going about hopping on the hind legs tends to the general likeness; moreover, in some there are front teeth greatly resembling those of the gnawing, or Rodent animals, and in all the back teeth are somewhat like those of insect-eating animals, or *Insectivora*. But a little care will show that all these animals are sufficiently distinct so as not to be classified with the Lemuroids in the same group of the animal kingdom. The fact that the Lemuroids have large thumb-like great toes, which enable the foot to be used as a hand, is quite sufficient to distinguish them from animals with paws, and all those mentioned above.

A curious mistake was made by confounding a Lemur with the Sloth (which is never found out of South America, where also there are no Lemurs) in the diary of a correspondent to one of the most important newspapers in the world, and which was read with universal interest, and certainly with great amusement, during the Ashantee War. He wrote:—

"Sloths (!) of the two-toed variety abound in every part of the country. At night we always heard them, and much discussion did they cause. The cry is somewhat like the Nubian Hyena, and I think no evidence appeared besides this deceiving sound to prove the existence of Hyenas on the Gold Coast. It is only a monosyllable, *Ka*, repeated in scale, at longer and longer intervals as it mounts the gamut. Amongst the last octaves, the creature seems bound to burst. One listened for the final notes with ridiculous anxiety, lying awake in the still darkness. *Do, re, mi, fa, sol* passed off easily; but the *la* demanded evident exertion, the *si* exertion greater still, and so on at lengthening intervals, till one reached the octaves, which really seemed to split the beast's throat in utterance. I once heard a Sloth compass six octaves, but he generally finds his ultimatum at the third. The native story goes that the animal makes only a pitiful moaning when on the ground, but no sooner is he arrived on the tree-top than he utters this piercing cry; and therefore, as Mr. Bonnat told me, the Ashantees, a quick-witted people, call certain chiefs of theirs *coco'hoo*, or Sloth, because whilst they were small men they sang small, but they crow very loud from the 'stools' to which the king thus raised them. . . . I believe Mr. Winwood Reade shot a fine Sloth at Mansu. The only specimens I myself saw were two young ones, both captured by cutting down the tree on which they sat. They had pretty grey furs, and the same anxious wretched look common to their family. Those who still credit the old belief about Sloths—if there be any—would have been much disconcerted to observe the activity these creatures showed in running up and down the pole to which they were tied, walking head downwards, of course!"

The Lemuroida as a group have some general characters in common. Firstly, they are all Quadrumanous, and the hinder thumbs are in most very large, strong, opposable to the other digits, and capable of much movement. Furnished also with well-made thumbs on the hands, they have a great power of grasp, and of clasping boughs and large creeping plants during their active climbing and jumping. Then there are special structures on the tips of the fingers; these are flattening of the tips into disc-or button-shaped pads, on the upper surface of which is the nail. The skin of these rounded tips covers a cushion of fat, and is well supplied with sensitive nerves, and hence they are not only

cushions, but extremely fine points of touch. Their use is evidently connected with the extremely agile boundings, from branch to branch, during the hours when there is little or no light. The sense of feeling, then, replaces that of sight to a great extent, and the supply of nerves is sufficient to excite the muscles of the fingers and hands, toes and feet, to hold on at the least touch; while the cushions of fat prevent the extremities from being jarred. These curious tips give a very clumsy appearance to the digits, even when they are extremely small. There is a true claw on the second digit (toe) of the foot, and nails on the other fingers and toes in some Lemuroids, but there are different arrange-

LEMUROIDS AT HOME IN MADAGASCAR. (*After Grandidier.*)

ments of the claws in others. It is noticed when several kinds of them are examined, that there is a great difference in their digits as regards their size and length, and the fourth is the longest instead of the third, as in man: but sometimes the index, or first finger, not counting the thumb, is much reduced in size, and in two forms it is very defective, and only a little knob remains to show its position; but this apparent deformity has something to do with their method of life. The thumbs are well formed, and so are the third, fourth, and fifth digits, the index being as just mentioned, and the result is to divide the hands, as it were, into two opposing portions, giving a grasp like that of the climbing birds—the Parrot, for instance. These kinds of Lemuroida creep slowly towards their prey, and clasp the branches firmly before they jump on the insect they desire to catch. Besides these peculiarities of the hands and feet, which, moreover, are supplied in every joint with tendons and muscles of great motive power, the fore-arm is capable of turning the wrist forwards or backwards, or, as it

is called, rotating, and also of bending. Again, the upper arm is loosely but firmly attached to the shoulders and neck, so as to admit of great range of motion, so what with the bending and rotation of the fore-arm, and the mobility and cushioned state of the fingers, these creatures possess a wonderful apparatus, suited for extreme action and safe holding on. The ability to rest on the hind legs and jump like a Kangaroo (see page 5), which is peculiar to some kinds, depends also upon peculiar structures. The ankle-bones are very long in these, so long, indeed, as to make the foot resemble that of a Frog when jumping more than that of any other animal. The long ankle-bone acts as part of a lever, and enables the muscles of the back of the leg to act on the foot so as to project the creature high in the air, or for many feet from one bough to another, or along the ground. There is nothing like this in the Monkeys. Now, the woolly fur of the Lemuroids, and their cylindrical woolly tails, at first sight appear to be encumbrances to an active animal which lives in the tropics, but they are all extremely chilly creatures, and love heat; moreover, it is possible that severe falls may be rendered less injurious by the deadening influence of a soft fur. The tail is a wonderful apparatus in some kinds, and barely exists in others, being, however, never prehensile even when longest and strongest. Probably it is used as a kind of adjuster of movements in rapid exercise, and certainly it is a great comfort to many, for several kinds like to curl it over their backs, or round their necks, like a sable boa, whilst they are asleep, or basking in the sun. In one kind it is supplied with a marvellous set of tendons, and, indeed, to such an extent of complexity, that it would appear that Nature had lavished mechanical appliances to every joint without any very definite use. It is remarkable that in those Lemuroida which have no tail, or barely a trace, there is a curious arrangement of the blood-vessels. The limbs in these kinds are not supplied with main arteries, and veins with long branches, but the blood-vessels form a closely-packed set of tubes of very small size. This network, in the language of science, is called a *rete mirabile*, "a wonderful network," for such it is. Curiously enough this arrangement of the blood-vessels is found in some totally different animals, whose movements are very slow and cautious, such as the Sloths, for instance. Equally slow are the movements of some of the kinds of Lemuroida which possess this interesting structure. It has been suggested that this novel division and subdivision of the blood-vessels tends to produce slowness of movement, and it may be said in a general way that the active Lemuroida and active animals of other orders do not have a *rete mirabile*.

HEAD OF INDRIS (PROPITHECUS) VERRAUXII, TO SHOW LEMUROID NOSTRILS. (*After Grandidier.*)

Some Lemuroids have short, and others have long muzzles, and there is great variety in the shape of the head. Evidently those with long noses have a very fine sense of smelling, and the whole of the members of the sub-order have a peculiar twist in the outside nostril, which distinguishes them from the Monkeys of both the Old and the New World. This twist was thought to be of great importance in classifying the Lemuroida in the animal scale, and they are often at the present day termed "Strepsirhini," from the Greek words which mean curved nostril. Some scent out insects and grubs under the bark of trees, and all use this sense in searching for food by night. There are some long hairs about the upper lip and cheeks like those of a Cat, and these "smellers" are doubtless extremely sensitive to touch, and although they do not assist the sense of smelling, they help the animals in avoiding danger in their movements through the dark underwood.

The colour of the iris (the membrane around the pupil of the eyes) is very beautiful in most, and as the eye is large and staring, it is well seen. Sometimes the pupil is round, but in some kinds it is a slit, as it is in the domestic Cat, for instance, and this shape has much to do with their nocturnal habits. The iris moves in two directions, and makes the pupil either larger or smaller; and the importance of this gift is, that whilst a small pupil admits only a very slight quantity of light into the body of the eye, a large one allows a great amount to enter; hence, at eventide the pupil dilates, or, in other words, the iris acts so as to enlarge it, and all the light possible enters, but in sunlight the pupil contracts,

even to a point, the iris moving so as to shut out the superfluous and injurious illumination. The nocturnal kinds require a very dilatable pupil, for they move often in comparative darkness, and when the least ray of light is of benefit to them. Besides this structure, there is another which has to do with husbanding, and making the most of faint light. If the eyes of a Lemur are examined a little carefully, they will be found to glare with a very metallic lustre in certain lights, just as those of a Dog and Cat. It appears that in certain animals, and in the Lemuroids, there is a peculiar layer within the eye which looks coloured, but really it is only very finely marked by fibres, which decompose the common white light into its primitive colours, in the same manner as the extremely delicate markings invisible to the naked eye on mother-of-pearl produce the well-known beautifully iridescent tints. This layer is behind the sensitive layer of the eye, and it acts as a concave reflector, collecting the slightest glimmers, and making them of use. The membrane is called the tapetum. It has been noticed that there is a difference in the expression of the eyes of the Lemuroids and Monkeys, and certainly these last have the advantage of showing their impudence, malice, and fear in their beautiful organs of sight.

EYE OF LEMUROID, SHOWING CONTRACTION AND DILATATION OF PUPIL. (*Original, after Murie.*)

The ears of some Lemuroida are small, but in the majority not only are they large, but they possess singular powers of movement, and in some can be folded up. The sense of hearing is undoubtedly acute in the nocturnal kinds, and their capacious ears are of immense importance to them, for they have to discover their prey by their sense of smell and sight, and also to be on the alert against their natural enemies.

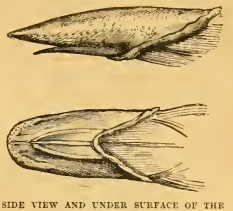
There is a singular want of sameness in the teeth of the Lemuroida, and several kinds, which apparently lead the same sort of lives, and eat the same food, have different arrangements of the cutting and grinding teeth. Sometimes the front teeth fall out when the second set is cut, and are not replaced, and in the Aye-Aye they act as perfect chisels. As a rule, in all kinds, the lower front teeth project horizontally forwards from the jaw, and somewhat resemble in their direction those of the Marmosets, but the upper ones are straight. As the Lemuroida live easily and perform movements of very much the same character year after year, their brains are not much called upon. They are not as tractable or as intelligent as Monkeys, and although their muscles act with vigour and ease, still they are not required to perform the actions which are regulated by the superior intelligence of the Apes. Hence it is not to be expected that the brain of the Lemuroida will be as well developed as that of the Ape or Monkey. It is, in reality, not so bulky, and not so convoluted. The brain is low in height, longer than broad, and does not cover the cerebellum. Finally, the young Lemuroida are nourished within their parent through a placenta, which is diffuse, and more or less disc-shaped, and therefore unlike that of the animals already described, and of man.

UPPER SURFACE BRAIN OF LEMUR CATTA. (*Original, after Murie.*)

They have a peculiarity about the under part of the tongue, namely, beneath its tip there is a fringe of scaly flesh, the free ends of which, when the mouth is shut, fit in between the front teeth. Its use is unknown, but some have said that it is to keep the back of the teeth and the spaces between them clean.

It is their general shape, and the possession of what may be called a toe-thumb, which makes the Lemuroids resemble Monkeys, but the likeness is not with those of the Old World, but with the furry Marmosets, with long canine and projecting front teeth, of the New World. But although there are these points of resemblance, the intelligence of the Monkey is far in advance of that of the Lemur, and this can be well estimated when their eyes are compared. In the Monkey the eye is very movable, full of varying expression, and often has the aspect of supreme cunning and mischief; but this is never the case in the others, whose fixed, staring eyes have no speculation in them.

Differing as they do from the world of Monkeys, the Lemuroida still resemble them as a whole, more than they do any other animals, and therefore they are associated with them in the scheme of classification. They belong, therefore, with the Monkeys, and man, to the *Primates*, and as they present important differences from the Monkeys, they are classified in a separate sub-order of the Primates. This sub-order is called the Lemuroida, a term which has already been explained. Some zoologists, impressed with their great resemblance to the Apes, have called them the Half Apes, and others, looking upon them as the forerunners of the Monkeys, term them Pro-Simia.



SIDE VIEW AND UNDER SURFACE OF THE TONGUE OF A LEMUROID.

The Lemuroida live in very out-of-the-way places, and the majority are in Madagascar, which is an island very little visited by Europeans, and where some naturalists have studied them and their habits under great difficulties. The skins of captured specimens have been stuffed, and a few living kinds have found their way to England; hence there are some fine groups of stuffed Lemuroida in the British Museum, and some living species in the Zoological Gardens. Marvellous stories, of course, abound amongst the natives regarding their tricks and habits, and the sober truth has been very difficult to distinguish from error, especially as the night is the scene of their gaiety. Nevertheless, during the last few years much knowledge has come to hand about these interesting creatures, and it has been rendered all the more important by the labours of the comparative anatomists, who have dissected many kinds of them, and described their results.

There is no doubt that at first sight they are uninteresting. Many sleep most of the day, as a rule, and they cannot be got out of their snug little dens in the Zoological Gardens during visiting hours except by force, and then they look dazed and stupid. But a careful observation opens out much that is extremely interesting in their habits, and shows how remarkably their limbs and bodies are adapted for a singular and nocturnal life. Take an example:—Some Lemuroida, which live in Caffraria and South-eastern Africa, are called "Galagos" by the natives, and the name has been adopted by zoologists. One of these is of an uniform dark brown colour, and the tail is long, cylindrical, and woolly, the ears being large, rounded, and black, and it is called the Black, or Garnett's Galago. There is nothing to be made of its habits during the day, but if any one is affected with sleeplessness, and desires a domestic pet that would enliven the dreary midnight hours, then forthwith let him purchase a specimen, if possible a pair of them. They will rest quietly enough and contented in their berths during the day, but only let them have freedom in the chamber for a while at night, with a Cat or Dog for companion, and, *presto!* the dull hours will be merry. The following is Mr. Bartlett's (Superintendent of the Zoological Gardens) experience in a letter addressed to one of us:—"The other night I took an opportunity of letting one of these interesting creatures—Garnett's Galago—have his liberty in my room, and I assure you I was well repaid by his performance. Judge my utter astonishment to see him on the floor, jumping about *upright* like a Kangaroo, only with much greater speed and intelligence. The little one sprang from the ground on to the legs of tables, arms of chairs, and indeed on to any piece of furniture in the room; in fact, he was more like a sprite than the best pantomimist I ever saw. What surprised me most was his entire want of fear of Dogs and Cats. These he boldly met and jumped on at once, and in the most playful manner hugged and tumbled about with them, rolling over and over, hanging on their tails, licking them on the head and face. I must add, however, that now and again he gave them a sharp bite, and then bounded off, full of fun at the noise they made in consequence of the sly nip he had inflicted. This active trickery he never appeared to tire of; and I was myself so pleased on witnessing the droll antics of the creature that the night passed and it was near daybreak before I put a stop to his frolics by catching and consigning him to his cage. In bounding about on the level ground, his jumps, on the hind-legs only, are very astonishing, at least several feet at a spring, and with a rapidity that requires the utmost attention to follow. From the back of a chair he sprang, with the greatest ease, on to the table, four feet distance. He was delighted with a little wooden ball,

which he rolled about and played with for a considerable time, carrying it in one hand while he hopped and skipped about in high glee. He eats fruits, sweetmeats, bread, and any kind of animal substance, killing everything he can pounce upon and overpower. This strong and active little brute thus eats his prey at once, as I had proof in an unfortunate Sparrow which he unmercifully devoured head first."

Another pair of these Galagos, since kept in the Society's Gardens, at dusk and nightfall behave quite as actively. Most unwillingly are they poked out of their comfortable sleeping-box during the day, or even when becoming dark, until they hear the keeper sounding all visitors out, and quietness reigns. Immediately, then, they are full of life, and utter an extraordinarily loud and prolonged ka-ka-ing yell, a sort of *feu-de-joie*. From even till morn there follow unceasing motion and occasional ejaculation, until, on the appearance of the keeper, they retire to rest.

GARNETT'S GALAGO.

The number of the Lemuroida is considerable, and they have been grouped in at least twelve genera, and these, again, have been arranged in families. These will be classified by-and-by. It is extremely difficult in many instances to distinguish one kind or species from another, in consequence of the great sameness of shape, and the fact that the same individual has a different coloured coat at various times of his life, and that the males and females of the same kind are often differently coloured.

It will be seen, on reading the description of the Monkeys in the first chapters, that they can be arranged not only by their peculiar structures into grand groups, but by the particular parts of the world they inhabit. Hence they have been divided into those of the Old and of the New World. Now, something of the same kind may be done for the Lemuroida, but not quite as perfectly. There are six genera of them living in Madagascar, three in Africa, and three in the great Asiatic Islands and Hindostan. But although some of those of one locality are very distinct from those of others, it is not always so, and one Madagascar and one African group present close resemblances, and, curiously enough, two West African genera are classed close to two whose kinds live in Ceylon, Hindostan, and the island of Borneo.

No Lemuroid has ever been found in the New World, or in Australia. It will then be convenient, in order to avoid too much anatomical description, to separate at first the Lemurs geographically, and the first to be noticed are those of Madagascar.

As yet very little is known about the natural beauties of the great island of Madagascar. Very few books have been written about it, and nearly all of them are devoted to descriptions of the manners, customs, and religions of the different tribes. In fact, missionary work and political enterprise rendered the publication of such works necessary, and, with rare exceptions, the beauties of Nature, and the interesting fauna and flora, were treated with neglect.* Moreover, the jealousy of the governing powers prevented many of those travellers, who were competent to observe Nature and to appreciate her beauties, from exploring large tracts of the island. Descriptions, then, of the characteristic scenery, and of the habits of most of the animals of Madagascar, are exceedingly scarce; and, indeed, those which do exist cannot all be believed, for one geographer, whose work teems with lively anecdotes, and with illustrations of forest and upland, is stated by a later writer never to have left the eastern coast.

It appears, however, that the scenery of the great island is very varied. There is a long line of sea-coast, which is fertile in some places, but very sterile and unprofitable in the south especially. This coast-line limits the forest land, which forms a belt around the higher mountains of the central part of the country, and the hill or comparatively treeless district is broken and very romantic. Those who hunt the Lemuroida know that it is useless to seek for certain kinds everywhere; and, indeed, their experience proves that each of the different districts of the island has a peculiar little assemblage of these "Half Apes" amongst its trees. The silence amongst the woods, where the luxuriance of vegetation is extraordinary, is most remarkable. It is so different from the noise and motion within tropical forests in other parts of the world, and it is only at the end of the day, when the short twilight approaches its close, that the quiet solemnity of the scene is broken by the cries and agile movements of the various Lemuroida. The quietude is produced by the absence of the whole of the Monkey tribes from Madagascar, for they are the great noise-makers of the forests of other tropical countries, and by the indisposition of most of the Lemuroids to move by daylight. They hide themselves in nests of leaves or amongst the densest foliage, and some seek the tops of the highest trees for safety. They seem to know that the hunter will seek them by day if possible. But as the dusk approaches, the quiet, solemn-looking creatures begin to move, jump, swing, and run along the branches with a wonderful dexterity and rapidity. They rarely come to the ground, and when they do so, their gait is clumsy, but up in the trees their motions are graceful and noiseless. They cry out to each other, and appear to take a delight in disturbing the echoes of the night, and after eating their fill they become quieter towards dawn, when they retire to their hiding-places looking dazed and half-blinded by the light. Some of the kinds called *Indris*, now about to be described, illustrate these remarks very well; thus one species is only found in little patches of forest land, quite in the extreme south of the island, where the country is sandy and poor, whilst a second is found in the north-east of the island amongst the luxuriant woodland. Some keep to the districts where the bamboos abound, much to the disgust of the hunter, for the covert is thick, and the leaves very destructive to clothing. Probably it is the difficulty in trapping and shooting some kinds, and their night-life, which gives them a superior intelligence in the eyes of the natives, who hold some which are very man-like, having no tail, or only just a stump, in great veneration.

GENUS INDRIS.

The distinguished traveller of Madagascar, M. Grandidier, found it very difficult to obtain much information about these Lemuroids, the name of which is the same as a native expression of surprise, such as "Look, there it is!" He undertook a very perilous journey by sea and land to the south of the island, and there he found the favourite woods of some, and also in the south-west. He arrived in a coaster, in June, 1866, off Fort Dauphin in the south-east of the island, and being blown out to sea, gained

* An exception must be made in favour of the "Histoire Physique, Naturelle et Politique de Madagascar," of M. Alfred Grandidier.

the southernmost cape, St. Marie, off a most inhospitable and arid shore. A long row of sand dunes, without a trace of vegetation, bounded, in the background, a low coast-line of rocks, which extended far into the shallow sea, being constantly hidden by furious waves. Not a trace of man or of dwellings could be seen. The sand dunes slope towards the sea at a high angle, and are at least 150 yards high. Their tops are flat, and continue backwards into the country for some distance. They are composed of broken shells, and are covered here and there by a stunted spiny vegetation. It was on the slopes of these dunes that Grandidier found portions of the eggs of the extinct colossal bird Æpyornis. Beyond the dunes is a vast plain without even small hills, and covered with a scanty vegetation of groups of deformed trees; but in the remote distance hills are seen, and then there are numerous forests.

Some species of Indris live in these stunted forests of deformed trees, in bands of ten or twelve, and never come to the ground except when pressed by hunger. When seen under such circumstances, they stand up on their hind feet, their tail hanging behind them, and they advance by little hop-like motions, resembling those of a child that jumps with its feet tied together.

They are nearly white in colour, and are called *Sifac* by the natives (page 212), and are looked upon with veneration, for they are not very unlike very small men in general shape, especially when they stand erect. In common with all the Indris, they are slim, tall, long-legged animals, with very strong feet, with a large and well-formed thumb-like opposable great toe. The head is very furry, and the ears, tufted with hair, are almost, but not quite, hidden, whilst the muzzle, moderate in length, projects between the staring eyes. They have a longish neck, and the body seems to be compressed at the sides. All the fur is soft, and stands out, and that of the tail makes it like a Fox's brush, but is more slim and cylindrical.

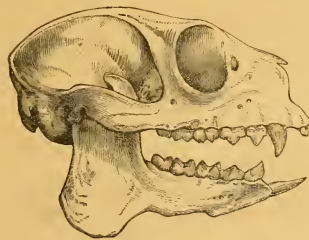
But there is a curious arrangement of the fingers, for the index finger of the hand (that is to say, the first finger, not counting the thumb) is shorter than the fifth, so that their "fore finger" is a little finger. The toe-thumb is placed widely from the toes, and rather backwardly, and the toes are united together by a kind of fold or web of the skin which reaches up to the first joint; moreover, the first toe (not including the toe-thumb) has a curved claw on it. They are not good walkers, any more than the Apes, although, like them, they assume the erect position, and it is only on very rare occasions, and when it is necessary to cross a tract of land to get to trees with more fruit upon them, that they attempt to put the foot to the ground. It is not their natural position, and they seem to be quite out of their element. When they come to the ground they rest on the outer edges of the feet, and soon drop on their hands, on the corresponding parts of which they support themselves. So walking is performed with difficulty, and not with grace, and in this they may be compared with the Orangs; but in the Indris the arms are always shorter than the legs. In the trees and branches, which are their favourite haunts, they climb easily, rapidly, and with grace, running along the boughs, jumping to great distances, and alighting with unerring certainty, and clinging on with wonderful tenacity. The structure of the muscles, bones, and ligaments enables them to lead this active arboreal existence, and so strong is their power of grasp, that it remains sometimes after death, for it has happened that in shooting them whilst clinging to the branches they have remained suspended after having been mortally wounded, or dead.

Being dwellers in the foliage of the trees, and amongst the network of branches, twigs, and creepers, the kinds of Indris have a choice of many kinds of food. Leaves, buds, fruit, insects, eggs, and small birds are constantly within their reach, but usually they do not hunt or chase prey, and are satisfied with the best fruit they can find, and other vegetable substances. Nevertheless, they do not despise or reject a bird as something out of the common way of diet, and they open the skull and suck the brains. The teeth are not very well suited for stopping and killing living prey, for in the grown-up individuals there are no lower canines, there being only an upper pair, and thus one of the most important seizing and killing arrangements is absent. On the other hand there are plenty of crushing teeth, with sharp points to them, which enable the Indris to champ fruit without much side to side movement of the jaw being permitted. There are two false, or premolars on each side in both jaws, and three molar teeth behind them. Besides these there are four front teeth in both jaws. In all there are thirty teeth, a smaller number than in any of the animals yet considered.

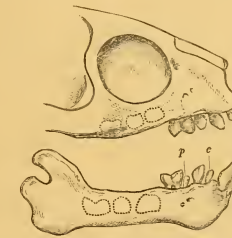
The upper front teeth, or incisors (four in number only), project forwards very slightly, and nearly bite up and down; but the four lower front teeth (incisors) project well forwards, and the outer pair of

them are sometimes called canines, but their office is plainly the same as that of the other front teeth. The predominance of the crushing teeth (there being twenty of them) over those adapted for tearing flesh, denotes that these animals should have a vegetable diet, and this requires larger digestive organs, as the food is bulky. So it is found that the stomach is single, and then there is a very large cæcum, or blind-gut, which ends in a large intestine, which is very long, and twisted on itself, so as to form two regular folds, one on the other, instead of one, as is commonly observed in the higher animals already noticed; in fact, the arrangement is not very unlike that of the sheep, whilst the cæcum is on the same scale as that of that great vegetarian, the Rabbit. These large parts of the digestive apparatus are common to most vegetable-eating animals, whilst the flesh-eaters have them short and small.

But the Indris does not begin life with the prospect of being a vegetarian, for it has a first set of teeth, or milk teeth, as they are termed, and these are shed to make way for the second, or permanent set. Now, it is most curious that the young should have more teeth than the elders, and that were



SKULL OF BLACK INDRIS, SHOWING ADULT DENTITION.



MILK DENTITION OF INDRIS. *c*, CANINE, AND *p*, PREMOLAR, NOT REPLACED IN ADULT.

this first set to persist through life, it would indicate a very mixed-feeding animal. The little ones have no less than thirty-four teeth, and they have two lower canines, and two extra lower false molars more than the adults. As age increases all these first teeth gradually fall out, and are replaced, to a certain extent, by the second set mentioned above.

Now, what is the meaning of this? Why should the young have a larger set than the adults? Clearly those of the adult are admirably adapted for its life, and it is equally evident that those of the young are of no particular use to them. They are either suckling, or are eating fruits obtained for them, and do not kill and feed on birds and living things. It is found that the milk teeth of Indris correspond with the adult or permanent set of such an animal as the Ring-tailed Lemur, which belongs to a different genus. Hence the perfect condition of the teeth of the genus Lemur are the same as the first arrangement of the teeth in the genus Indris. It tends to prove that there is some genealogical relationship between the two genera, and that they were derived from a common ancestor. Moreover, it may be assumed that the milk teeth of all animals are inherited from a perfect and adult ancestral form which was less highly organised or constituted.

It is said that the female Indris has but one little one at a time, and that they are all gentle and timid, being rarely kept for any time in captivity. They are nocturnal in their habits, and evidently have extremely sensitive vision, and, like the others which lead this life, they are protected from many jarring falls by the structure of their hands and feet.

THE DIADEM INDRIS.*

This is a fine species, with a white furry ruff, or crown, on the forehead and around the face, and it has a long muzzle and body, and a thick, long tail. It greatly resembles the White Indris, called

* *Indris diadema.*

Sifac, with the exception of its characteristic head ornament, and leads the same kind of life in another part of the island of Madagascar. Fine stuffed specimens of it, and of many other Indrisinæ, are in the British Museum, and it will be noticed that they are there called, not Indris, but Propithecus, which is another name for them. It is a question of the value of a tail in classification, which produces the two names for one genus. Some zoologists are impressed with the great importance of the tail, and do not class species together as a genus, although they may have strong resemblances,

DIADEM INDRIS AND WOOLLY INDRIS. (*After Grandidier.*)

unless they all have or have not tails. Others do not consider the possession of a tail to be of such great importance when the other characters are sufficiently close to render it advisable to form them into one group. The same question arose in considering the Monkeys, for in the genus Macacus we admitted Macaques with and without tails; and also in the genus Cynocephalus, in which there are some with good, others with small, and a few with very stumpy tails, the same caudal latitude was given. Hence, it is not consistent to form two genera of these creatures, one with a tail (or Propithecus) and the other without one, or with a stump (or Indris). Indris contains the Lemuroids, whose other resemblances are so great that they overweigh the tail question. So little is known about the Diadem Indris that it is only necessary to notice one point in its anatomy, which refers to its habits. It evidently assumes the semi-erect posture very frequently when climbing, and a great part of the weight of the body is felt by the foot, and its great clasping toe-thumb. The examination of the foot proves that it is one, and not a hand, for bone for bone it may be compared

with the human foot, and that of the Apes. The great toe is wide apart from the others, and in that it resembles the thumb of a hand; but all the other bones of the ankle or tarsus are in the same relative position as they occupy in us. They have the same names. Their foot is very broad, and this is produced by the extra size of the four front bones of the ankle, and these form an arch, the three inner ones being more or less wedge-shaped, and the outer, or fourth, is more or less of a cube in shape; hence they are called the wedge-shaped (cuneiform) and cube-shaped (or cuboid) bones. They are jointed in front to the long bones (metatarsals), and behind to the three other ankle-bones. All are

BLACK OR SHORT-TAILED INDRIS. (*Modified after Grandidier.*)

united more or less solidly by ligaments, and yet there is motion. Now in this Indris the wedge-shaped bones are large, especially the second from the inside, or the middle one, and curiously enough this is small in most other Lemuroids. The large arch formed by these bones contributes to the strength of the foot.

The Diadem Indris is found in the forests of the central parts of Madagascar, and appears to keep apart from other kinds and to roam about the dense woods in bands.

THE WOOLLY LEMUR—THE AVAHI.*

This is one of the long-tailed Indris, and is remarkable for having long hinder limbs, a long furry tail, a very short muzzle, and a round head.

It was first described by Sonnerat, in his voyage to the East Indies, who called it the

* *Indris laniger.*

Makis à bourre, or the Woolly Makis. On the north-east coast, the natives call this Indris the Amponghi, and this name is given to it in the great forest of Tsasifoutt, which is in the island of St. Mary, adjacent to Madagascar. This is an interesting point, for it affords evidence that the island of Madagascar had once a greater geographical extension, and that St. Mary's and the other small islands along the coast were at a former period continuous with it. These woolly Indris are not frequently caught, or indeed seen at all, for they hide during the daytime, and sleep curled up amongst the thick shade of the foliage, or in some comfortable nest in the hollow of a tree. At night-time they wake up, and eat and play amongst the trees on which their food grows. They are said to be stupid animals, but probably, as they have never had their intelligence tested except when half asleep, they may be quite as intelligent as the other Lemuroids, and this opinion is strengthened by the fact that the brain of the *Indris laniger* is large in proportion to the size of the body; larger indeed in proportion than the brain of any of the others. It is this relative size of the great organ of the nervous system which has impressed some zoologists with the propriety of placing this Indris at the head of all the Lemuroids, and nearest the Monkeys.

The animals are small in size, and a dried skin measures rather more than a foot and a half in length, from the muzzle to the root of the tail, and this latter appendage is thirteen inches long. The head is broad over the eyes, which are wide apart, and the muzzle barely projects, and the whole of the face is covered with short hairs of a reddish-brown tint. There is a distinct band of whitish fur placed across the top of the forehead, and which has fur before and behind it of a darker colour than the rest of the hair of the body. This band is curved, and forms a point which projects forward in the middle line of the forehead. The fur on the back and flanks of the body is of a dark grey colour close to the skin, but on its surface the colour is brown more or less rusty. This is the tint on the extremities, the grey colour underlying. On the backs of the thighs there are white patches, and at those spots there is no deep-seated grey tint. The cylindrical tail is reddish-brown, like the hands and feet. The ears are short and rounded, and are generally hairy, but not tufted, and they are hidden in the fur of the head. The nostrils are separated by a narrow septum. The feet are short and broad, and the claw of the toe is long and cylindrical.

Although the muzzle is so short, the teeth are set so as to be in a long row on each side, for the front cutting teeth are not placed side by side, but in front of each other, and there is a strange gap between the inner ones in the upper jaw. Then the canine teeth, seen, of course, only in the upper jaw, are very broad, and the next teeth to them (the first pre-molars) are as large as they are. This is a marked peculiarity, and there is no other creature except man that has these teeth so closely resembling each other. To complete the notice of this little highly-constructed Indris it is necessary to remark that its wrist-bones resemble in their number and place those of man and the higher Apes. The Gibbons and all the other Monkeys have an extra bone to the wrist, called the *intermedium*, and this is present in the Indris already noticed, but it is absent in this Avahi, and in the next kind about to be described.

The next species to be noticed was never included in the so-called genus Propithecus, as it has only a short stump of a tail, but has always been taken as the special illustration of the group *Indris*.

THE SHORT-TAILED INDRIS.*

This species can be distinguished from all others by its stump-like tail. It has a long muzzle, visible hairy ears, and generally speaking the fur is black; it is marked, however, with white hairs on the fore-arms, back, and hinder quarters. As regards the teeth, there is some variability in the size of the upper incisors in different individuals, and the front pair may be smaller or larger than the hind pair. The inhabitants of Madagascar call it the Babakoto (*baba* means "father," and *koto*, "boy"). This Indris, which attains the height of three feet, is found in the interior of the east of Madagascar; and when Vinson travelled through one of the great forests in that part of the island, he was constantly annoyed by the incessant noise made by numerous bands of them, which kept themselves, however, out of sight, and hidden in the dense foliage. The natives consider the Babakoto sacred, and believe that the trees on which they live yield leaves which will cure all diseases. Moreover, they tell some

* *Indris brevicaudatus.*

astonishing stories about these objects of their veneration. They say that it is dangerous to cast a spear at one of them, for, if it misses its mark, the animal returns the weapon with a surer aim! They also assert that after a little one is born, the mother throws it to the father, who is usually up a tree close by, and he throws it back again! This exercise is repeated several times; and if the young one is invariably caught it is reared with care, but if it tumbles, there is an end of it. They train the Babakoto to catch birds; and it is said that they become as useful as Dogs; moreover, it appears that, although these Indris are in the main fruit-eaters, they will not despise the brains of birds, which they suck with evident delight.

The skull of an Indris has large orbits, which are open behind into the space in which the temporal muscle works, and the "tear-canal" is in front of the orbit; moreover, the forehead, or frontal bone, is divided. The lower jaw has its angle, or the part between that which holds the teeth and that which rises up to be jointed with the skull, turned in, and the upper jaw in front is joined by the intermaxillary bones.

GENUS LEPILEMUR.

An animal which has no upper front teeth is certainly a curiosity, especially when its general state and habits resemble those of the other Indris and Lemuroids, and the Lepilemur is such a one. It is found in Madagascar, and it is interesting on account of the variable nature of the colour of the fur in different individuals, as well as from the nature of its teeth and its habits. It differs, however, so much from all the other Lemuroida, that it is placed by itself in a genus, and the distinctions are that when fully grown it has no upper front teeth, although it has them in the first, or milk set, and that it has also four teats for its young instead of two, as is the case in all the animals hitherto noticed. The name refers to its prettiness, and hence the genus is called *Lepilemur*.

This creature, considering its size, has an immense tail, as it is ten inches long, the head and trunk measuring only fourteen, and the whole animal forms a nice little meal for the natives of the north-west of the island. They call it Fitili-Ki, and as it eats the buds and leaves of trees it has a good flavour as a meat; hence it is sought after, but not hunted, for that is unnecessary. Knowing its habits the natives watch it, and, when it has left off playing and scampering about with its fellows (for it is very sociable), notice where it retires as daylight appears. There they find their prey quietly asleep, curled up in a comfortable nest of leaves, and they kill it with a stick. Hunting them would be useless, for they are quite nocturnal in their habits, and their activity in moving, and agility in taking prodigious bounds and jumps, are wonderful. Indeed, their body seems to be carefully made as strong as possible to meet the strains of their jumping, and there is a ridge of bone in the bodies of some of the vertebræ which strengthens the spine as a whole; moreover, the relation of the length of the ankle-bones and of the lower leg is that which is best adapted to their heedless rushings from branch to branch through the woods. Their nightly excursions for fruit and play are rendered all the more safe by their great eyes and widely open orbits, but how the eating the fruit is assisted by the want of the upper front teeth may probably puzzle most people. Perhaps the diet may require a greater use than is usual of the back teeth, and the lower ones are peculiar, for their front part is carried forward outside the next tooth before them in the jaw, giving thus much extra strength to the whole. This Weasel Lemur, or *Lepilemur mustelinus*, has fair-sized ears, and its colours are of all sorts of shades of red, grey, white, and yellow.

These animals hide their little ones, which do not get about much at first, in nests made in the holes in trees.

Another Lemuroid excited the attention of the members of one of the political missions, which was sent from the island of the Mauritius to the capital of the Hovas, in mountainous Central Madagascar. This animal was found in some numbers in the bamboo forests, which skirt the hills at their base, and many were caught in that of Alamazaortra. It seemed to live in the masses of bamboo leaves, and to wander about them by night, sleeping and resting by day in the deepest part of the woods. It is small, and has a short muzzle and a round head, and a long tail, the prevailing colour being grey, with red tints here and there on the back and head, which are paler below. It is a variable species, and some individuals are more olive than grey, but all have such peculiar teeth that they can be distinguished from all others of the sub-order. They have upper and lower front teeth, but the upper set are

very small, and are so placed that the canine teeth hide the outer ones; besides this character there are four teats instead of two.

M. Pollen, a well-known naturalist, says that the natives of the north-west of Madagascar call it the Bokomboule, and in Europe it has been named the Grey or Broad-nosed Lemur, the genus being called Hapalemur, and hence its proper name of *Hapalemur griseus*. The word Hapalemur means Gentle Lemur (from ἁπαλός, soft, gentle), and this appears to be their character. Hearing of their presence in the bamboo forests, M. Pollen wished to go there to hunt them, but he was strongly urged not to do so on account of the fatigue of the sport, and the difficulties likely to arise from the spines, thorns, and

WEASEL LEMUR. (*After Schlegel and Pollen.*)

sharp leaves, which readily produce wounds. He went, and after being well scratched and cut about, he returned with some specimens. The Hapalemurs sleep during the whole of the day rolled up, with the back curved, and the head between the thighs, the tail being curled over the back; but they are not so sleepy that they cannot escape from the hunter who seeks them. Idle enough by day, they exhibit a wonderful agility and disposition to romp and play at night. Their cry is like the grunt of a little Pig, and the greater part of their nourishment is derived from bamboo-leaves. One, which was kept by M. Pollen in captivity, ate bananas, but would touch rice only when it was half starved, and it had the strange propensity so often observed in some tame Monkeys of biting its tail.

The next group of the Lemuroids is that which has given the name to the whole sub-order.

GREY OR BROAD-NOSED LEMUR. (*After Schlegel and Pollen.*)

CHAPTER XV.

THE LEMUROIDA (*continued*).

THE GENERA LEMUR AND CHEIROGALE.

Called by the French *Makis*—Restricted to Madagascar—Their Activity—Different Species—How to distinguish them—THE RING-TAILED LEMUR—Reason for the Name—Tail—Colour of Body—Eye—Hand and Foot—Geographical Range—Anatomical Peculiarities—Playfulness in Captivity—THE WHITE-FRONTED LEMUR—Specimen in the Zoological Gardens—THE LEMUR OF MAYOTTE—Where Found—Colour—Manner of Life—THE MONGOOSE LEMUR—Description of one sent to Buffon—THE RUFFED LEMUR—Described by Ellis—Domesticated Specimens—THE BLACK LEMUR—Geographical Range—Hand—Foot—GENUS CHEIROGALE—Bushy Tails—Resemblance to the Hapalemur—Nocturnal Habits—Difficult to distinguish—THE FORKED-CROWNED CHEIROGALE—Wonderful Powers of Leaping—Cry—Reason for the Name—A Nest-making Variety—Specimens in the Jardin des Plantes—Resemblance to the Galagos.

THE animals which are included in the genus Lemur are popularly called by the French the *Makis*. They are restricted, geographically, to Madagascar, and to some of the adjacent islands, and are not found elsewhere. Instead of roaming along the boughs and through the woods with a restless activity during the night, after the manner of the Lemuroida already described, the Makis move, gambol, and jump with great agility by daylight. Resting during the hours of the night, they run along the branches after daylight, searching for their food, which consists principally of fruit and occasionally birds' eggs, and even of the small birds themselves. They are very active, and as the conformation of their limbs adapts them for an arboreal existence, they rarely come to the ground.

Having, without exception, all the peculiarities of animals which move and prey by day, it is very

curious that the species of Makis should be classified under a genus bearing the name of Lemur. But in this instance, as in many others, the original derivation of the name has but slight or even no reference to the peculiarities of the animals which are thus artificially designated by it, and of course great confusion results.

There are many species included in the genus Lemur, and there is great difficulty in discriminating between them, for many of them are very variable, and therefore it is probable that it will be much restricted with the advance of the knowledge of the zoology of Madagascar. All have a long snout, a small, flat, and long skull, and a long body with narrow flanks. The hind limbs are rather longer than the front ones, and there is a long furry tail. The feet and hands are short, and the great toe is broad; moreover, the ears are moderate in length, and are either tufted or are hairy. In some kinds the head is surrounded by a ruff of fur, and the colour of the hair differs according to the species, and is even different in individuals of the same kind.

Thus, a black Lemur, called *Lemur niger*, has a female which has white whiskers, and another with a black-and-white fur, which is called the Ruffed Lemur (*Lemur varius*), has a young one which is red, so that all these different tints having been formerly recognised as belonging to different kinds or species are now proved to be natural varieties of fewer species.

The males of many kinds differ from the females in colour, and from the young also; moreover, at certain times of the year, according to the age of the animal, the fur changes its tints, and a corresponding alteration is produced by different food, so that the great number of species of Lemur described by naturalists must be regarded with suspicion.

A careful plan in discriminating the species is to divide them after the fashion—but not with the same intention—of the late Dr. Gray, of the British Museum. He made certain groups, and called each a genus, but this last proceeding was not correct. One of his groups is as follows:—For example, Lemurs with faces without a ruff, the tail ringed, and a bald spot above the inside of the wrist.* The first kind about to be described belongs to this set, and is

THE RING-TAILED LEMUR—THE MACACO OF BUFFON—LEMUR CATTA—THE CAT-LIKE LEMUR.

All these titles refer to the pretty Cat-like Lemur with chinchilla-grey tints, and a banded tail of black and grey rings, which is commonly to be seen at the Zoological Gardens. It is so familiar, and has been so carefully examined, that it is advisable it should occupy some space in this description of its natural history.

The naturalist's name for this creature aptly denotes a Cat-like resemblance—a similitude due, perhaps, partly to size, certain tints of colouring, a peculiar arching of the back, and the long tail carried aloft, recalling at once purring Pussy. The tail, a striking feature, is several inches longer than the head and body taken together; it is clothed with abundance of long, soft, fluffy hairs, and alternately marked with rings of black and white. The predominant colour of the body and legs is chinchilla-grey, with a sprinkling of reddish hairs or rusty wash on the back; the under parts, however, are pure white. The cosy covering of delicate woolly fur, shorter than on the tail, stands out, instead of being smooth and sleek. The head is of a conical shape; the flattish depressed oval ears, by no means prominent, are sparsely hairy within, and are edged with short white hairs. The muzzle is nearly bald and black; the eyes are broadly encircled by the same colour, the remainder of the head and throat being snow-white. The eye, full, conspicuous, and softly expressive, is of a rich orange hue, with a dark pupil, and the eyebrows are represented by a few long black straggling hairs. There is a moustache and beard, but no vibrissæ (smellers), as in the Cat-tribe. The hind limb far exceeding the fore-limb in height, mainly causes the attitude of back-arching when on the ground. The fore foot is a kind of diminutive flat-nailed hand, with a proportionally short thumb, and it is hairy above, but naked below, and all the fingers have expanded cushions on their last joints. The hand is not capable of being closely clenched, and the thumb reaches only to the middle of the palm. The hind feet are large, and there is a strong great

* This classification is not that adopted by comparative anatomists, but rather by zoologists.

RING-TAILED LEMURS.

toe-thumb. Moreover, a true claw adorns the next toe, and in many other respects there is a certain agreement between the foot and hand. Both are black-soled, and the beautiful tracery of the pronounced cross lines, furrows, and folds would delight the heart of a gipsy fortune-teller. The mammæ, or teats, are two in number, and are placed near the armpits. Usually the species of Lemur have but one, or at most two, little ones at a birth, and the period of gestation is about one hundred and ten days, the young Lemur being born almost naked, and nearly without fur. Their hairs are short and sparsely distributed, except on the head, where they form a kind of belt around the eyes. They cling on to their mother's fur, and, holding on to that over her stomach and abdomen, they lie across her, so that when she draws up her legs she either hides the little one effectually, or it may be seen hairless in the folds of the mother's groins. After awhile, and as the young Lemur becomes better clothed and stronger, it leaves this snug and warm retreat, and crawls up on to the mother's back and shoulders, and seizes her fur, and holds on with such tenacity that she can jump and bound about without unseating her little burthen.

Lemur catta inhabits a circumscribed region. Its range is along the south and west coasts of Madagascar. Social, and banding together in troops, they feed on the fruits of the forest, and occasionally, it is averred, capture insects and small birds. Those kept in confinement, however, are far less carnivorous than the smaller and livelier nocturnal Galagos to be described hereafter. They seem remarkably sensible to cold, huddling and crouching close to one another as if heat and comfort were indispensable to their nature. At such times their tails are wound round the bodies of their companions and of themselves in a very odd fashion. Ordinarily very good-natured, they like to be fondled, and come down to be fed, uttering either a grunt of satisfaction or a loud plaintive cry, but it is stated that in Madagascar when the wet season comes on they become much excited, and rush about quite careless of danger, grunting terribly. They do not tease each other like Monkeys, and do not jump about on their hind legs alone, to do mischief of all kinds; on the contrary, they leap on all-fours with great agility and quietude, and in a light-hearted sort of way. They use their hands in grasping objects given to them, and feed themselves with them; but, like the Monkeys, they often scratch with the hinder extremities, and do not use them to put food to their mouths.

On looking into their anatomy it will be noticed that the back-bone has none of those graceful curves so characteristic of man, and which are modified and less perceptible in Apes. It is made for going on all-fours and jumping, and consists of some twenty-nine pieces, or vertebræ, there being also twenty-six in the tail. Having good lungs, the chest is capacious, but is long and flattened at the sides, and there are thirteen ribs on each side, and a central breast-bone, or *sternum*, composed of seven pieces.

The skull has large eye-cavities, or orbits, and (as in Indris) they are not closed behind by bone, but are open there, though the angle of the lower jaw is not turned in or inflected. The diet of the Ring-tailed Lemurs being both vegetarian and of insects, or an occasional small bird, their teeth are very equally distributed as regards their kinds. There is a good set of front teeth for tearing and incising, the full number of canines for piercing and killing, and the full number of grinders. The numbers are on each side of the upper jaw—two incisors, one canine, three false, or pre-molars, and three true molars, and on each side of the lower jaw is a corresponding number. Thus this arrangement resembles that of the milk teeth of Indris, but the front teeth of the lower jaw stick out in a remarkable manner. Corresponding with their teeth are the digestive organs, which are more suited for the assimilation of vegetable food than for a purely carnivorous diet. These measure nearly seven feet in length, and the blind-gut, or cæcum, is about a foot long. There is one point of great interest in the throat of this Lemur, especially when the animal is considered as intermediate between some Carnivora and the American Monkeys. This, the organ of voice, has a small laryngeal pouch, recalling, or rather foreshadowing, the great ones of the Howlers; and the bone at the base of the tongue (the hyoid) has a body and projections, which resemble those of the Carnivora rather than those of the Monkeys. In the wrist there is the ninth bone.

When in captivity, the Ring-tailed Lemur soon becomes attached to its keeper, and they show some powers of memory. A quartermaster of the French frigate *Duplein*, who had one on board, was recognised by it when surrounded by all the crew. This little creature liked to play with the cabin-boys and the Dogs, and took charge of, and protected, a little Monkey belonging to one of the sailors.

The Monkey was fondled and nursed, and cleaned with great attention by its active little friend; but corresponding kindness was not shown to the ship's fowls, whose tails it pulled unmercifully.

THE WHITE-FRONTED LEMUR.*

This is easily known by its broad band of white fur encircling the forehead, cheeks, and ears, and contrasting with the black muzzle, which is long and compressed. It is restricted in its geographical range to Madagascar.

Several of these White-fronted Lemurs have been brought to Europe from time to time, and have been kept in the Zoological Gardens. Their habits are simple enough. They often exhibit great vivacity, and are much given to leaping from one object to another, in which they are aided by the pad-like structures of the hands and feet.

THE LEMUR OF MAYOTTE.†

There is a kind of Lemur which lives in the island of Mayotte, one of the Comoro group between Madagascar and the mainland of Africa, and which is not found elsewhere. It is known as the Lemur Mayottensis, or the Lemur of Mayotte, and is remarkable for the strange variation in the colour of its fur. Probably there are five different colours, which are peculiar to different individuals of this species, and they have all received different names. These are termed varieties. But of what are they varieties, and which is the animal whence they have varied? These questions cannot be answered; and therefore this group of forms constitutes a species—a species really being a term which includes the sum of all the possible varieties of an animal. One of the varieties is the Black-fronted Lemur, which inhabits Madagascar itself, and as there is every probability that at one time the Comoro Islands were joined on to Madagascar, the existence of apparently different species, but really only varieties, can be explained.

These animals live in companies composed of from six to twenty, in the virgin forests of Mayotte, and they may be seen in broad daylight or at night. They lead an arboreal life, but they occasionally come to the ground after fallen fruit. They are hunted with Dogs, and when closely pressed, they take refuge in the highest branches, look fixedly at their enemy, growl, and wave their tails. When they see the hunter they rush off and take prodigious leaps, and go into the very depths of the forest. Should one be wounded it will defend itself against the Dogs, and will even jump upon them and bite their ears. They are fond of fruit, and especially of the wild date, and they wander far and near in numbers seeking their favourite food.

THE MONGOOSE LEMUR, OR WOOLLY MACACO.‡

The great naturalist Buffon had a Lemur sent to him as a present, which he kept as a pet for many years. At first it ran about the house, and was tame and full of fun, roaming here and there, and settling down before the fire like a common Cat. It was very good-natured, and became a great favourite; but with age came ill-temper, and it became cross and vicious; moreover, it was always making disturbances, so it had to be chained up. Having some ingenuity and perseverance, it managed to slip its chain now and then, and to escape. It made its way directly into the street, and used to visit a confectioner's shop, where it very quietly and systematically roamed in search of sweets, devouring all it could lay its hands on. If it could not get sweets it would take fruit, and was quite heedless regarding the price or the rarity of its desired treats. When it was known that it had escaped, if the shop-people had not already told Buffon, every one knew where it was to be caught, and a great trouble the catching was, for it got into corners, showed fight, and bit, and resisted being touched very decidedly. The cold, however, was its great enemy, and it always suffered much from it, and finally died from its effects.

The Mongoose Lemur, as it is often called, has a long head, flat forehead, and large canine teeth. It is of a reddish-grey colour generally, the crown of the head, the face, and chin being black; moreover, there is a streak of the same colour up the forehead, and across the crown. The cheeks and the side of the forehead are iron-grey, and this and its black nose distinguish it.

* *Lemur albifrons.* † *Lemur mayottensis.* ‡ *Lemur mongoz.*

It carries its fine tail well stuck up when it runs about, and jumps on all-fours from place to place, and grunts with pleasure when fed and noticed.

The last group of the genus Lemur contains kinds which have a ruff of fur on the cheeks and neck, and the ears are pencilled at the end, the wrist being moreover hairy. They are common in Madagascar, and two are worthy of notice—the Ruffed Black-and-White Lemur, and the Ruffed Black Lemur.

MONGOOSE LEMUR, OR WOOLLY MACACO. (*Male and Female, partly after Sclater.*)
(From the *Proceedings of the Zoological Society.*)

THE RUFFED LEMUR.*

Ellis, when journeying through one of the Madagascar forests, noticed, one bright, clear, and bracing morning, a peculiar shouting or hallooing, apparently at no very great distance. It was, he wrote, "not like any sound I had heard before, but resembled that of men or boys calling to each other more than anything else. At first I thought it was a number of people driving cattle out of the forest into the road. Still I heard no crashing amongst the underwood, and saw no signs of bullocks. Then I imagined it must be a number of bird-catchers, or squirrel-catchers. But on

* *Lemur varius.*

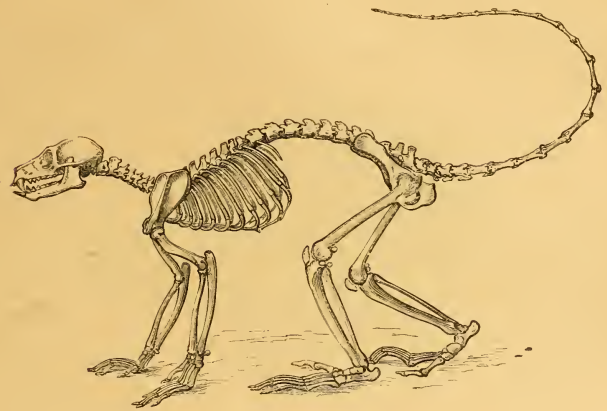
inquiring of my companions they said the noise proceeded from the Black-and-white Lemurs—*Lemur macaco*, or *Lemur varius* (Geoffroy)—of which there were great numbers in the forests. I had repeatedly seen Lemurs of more than one species in the market at Tamatave, and numbers among the people of the place. There were two or three of the large ruffed Lemurs in a house near my own dwelling, and they seemed to be quite domesticated. Though covered with thick, almost woolly, hair, they appeared to be ill at ease in wet or cold weather, but to luxuriate in the warm sunshine. I often noticed two or three of them together on a fine morning after rain raised upon their hind legs, on the outside of the house, leaning back against the wall with their fore legs spread out, evidently enjoying the warmth of the sun which was shining upon them. They are often kept tame by the natives for a long time, and numbers are sold to the masters of ships and others visiting the port.

RUFFED LEMUR. (*After Schlegel and Pollen.*)

We had one on board the ship in which I made my first voyage from Madagascar. It was a fine animal, and during the twenty-eight days of our passage I had frequent opportunities of observing its disposition and habits. It was tied to a boat on deck, and in a basket under the fore part of the boat it found a partial shelter from the rain and wind. It conveyed its food—boiled rice and fruit—to its mouth by the hand; and it was gentle and sociable, seemingly grateful for any trifling notice or kindness. I frequently gave it water, which it lapped like a Dog, and occasionally a banana; and in a short time it seemed to watch my movements whenever I came on deck, jumping on my arm or shoulder if I approached the boat; but was most delighted when, attaching a long line to the short cord tied round its body, I loosened it from the boat and allowed it to run up the cords or rigging, which it ascended with astonishing ease and speed, sitting sometimes with apparent pleasure on the extremity of the yard. It was scrupulously clean, and seemed unable to endure any tar or other dirt on its shaggy coat. One morning, during a heavy gale of wind, when there was much motion of the ship and great confusion and noise among the sailors, the Lemur seemed unusually excited, and clapped its hands together, and chattered loud in a most extraordinary manner, occasioning great uneasiness amongst

the crew of Malagasy sailors, who declared it was an omen of evil to the ship, and that some fearful calamity might be expected. I had felt so much interest in the sociable and apparently gentle animal on board ship, that I should have been glad to have seen some of its species in their own forest homes; but though numbers were evidently near, none of them came within sight."

This Lemur has, as its name implies, a black-and-white fur; the white tint is very general near the skin, and black is put on in patches, the tail being completely of that colour. It has a long face and skull, with a high nose and a narrow space between the eye cavities.



SKELETON OF THE RUFFED LEMUR. (*Modified after De Blainville.*)

THE BLACK LEMUR.*

It is this Lemur which has a mate with white whiskers and a white patch on the lower part of the back, whilst its own colour is uniformly black.

It inhabits the north-west of Madagascar, and the Sakalaves call it Acoumba. M. Pollen noticed one of the white-whiskered yellowish-red coloured females with a little black young one (a male) on its shoulders, and when the mother was shot, it fell with her, so tightly had it grasped her wool. They live in companies, and like the very tops of the tallest trees of the forest for their home; they are usually seen in the evening, when they make a great deal of noise with their concert of grunts and cries, and they jump from bough to bough quite as quickly as a bird flies. They have a trick of falling down suddenly, when pursued, into the underwood, and when the hunter searches for them they will be seen rushing off to a distant tree. When reared in captivity they are docile and affectionate. They like to sit on their keeper's shoulder, and will eat nearly everything that is offered to them. Fruit they prefer, but they will crack a bird's skull and eat the brain. In some districts of Madagascar these Lemurs are not allowed to be killed or to be kept either dead or alive, on account of some superstitious ideas of the natives.

One of the most remarkable peculiarities of this Lemur is the marked puddel nature of the hand. The palm of the hand is longer than the fingers, and the thumb is not much bigger than the little

* *Lemur niger.*

or fifth finger. The fourth finger is slightly the longest, and its tip, as well as those of the other fingers, is furnished with a well-marked pad, which gives a roundness and fulness to the last joint, or phalanx. The fleshy pads of the palm and fingers are also numerous, and the largest occupies the position on the palm of the ball of the thumb in man, whilst in front of this there is a pad space on the palm close below the first joint of the index finger. A smaller pad is placed behind the roots of the third and fourth fingers, and there is a pad at the root of the fifth digit. Two long pads are seen behind this last on the outer margin of the palm, which converge towards the great pad of the base of the thumb. These six pads of the palm form an ellipsis around the centre of the hand, and are of paramount importance in preventing the jar of jumping.

The under part of the foot of the Black Lemur is at first sight very much like a hard palm, with a great thumb, for the great toe is large and thumb-like. The four other toes are finger-like, and are very slightly

HEAD OF THE BLACK LEMUR. (*After Mivart.*)

larger than the fingers of the hand; and the sole, although narrow and rather elongate, resembles a palm somewhat. The second toe is small; and although it has a small pad beneath its tip, a distinct and sharp nail projects from the last phalanx. All the other toes have large pads beneath their tips, and assume more or less of a rounded shape at the ends. The great toe's pad is large and almost circular in outline. There is a large pad at the base of the great toe, which is almost divided into two by a furrow, and each of the remaining toes has a small pad at its junction with the sole, and there is one along the outer border. All these tactile pads with cushions of fat on the palm and sole act admirably as buffers, and prevent injury to the joints of the bones, as the Lemur terminates its leap by bringing its extremities in sudden contact with boughs or small trees. Moreover, they enable the animal to distinguish substances by their very sensitive surface. By being placed at the base of the fingers and toes on the palm or sole, and by being separate and along the edge of elliptical spaces, the movement of the fingers and toes still retains their independence. Moreover, the existence of a central spot between the pads favours the movements of the palm and sole, and assists in the opposable nature of the thumb and first toe. The pads on the under part of the ends of the fingers and toes appear not only to act as cushions, but to enable the Lemur to distinguish the nature of the substances with which they come in contact. They are therefore sensitive, and may be termed extraordinary organs of touch. A circlet of very long hairs projects and radiates round the ears of this Lemur, and gives the animal a very peculiar appearance.

GENUS CHEIROGALE.*

There are many very small bushy-tailed and almost Rat or Squirrel-like Lemuroida in Madagascar, which have a most curious habit. In England Hedgehogs, Dormice, and Bats—and in other countries the Marmot and other animals—hide up on the approach of winter, and go off to sleep for many a long day until warm weather returns, and food can be obtained; and this is done also by many reptiles, and not a few insects. They take their winter's sleep like the Water-rat—

> "And when cold winter comes, and the water-plants die,
> And his little brooks yield him no further supply,
> Down into his burrow he cozily creeps,
> And quietly through the long winter-time sleeps."

And in Madagascar, where the heat is always great, and there is a wet and dry season, food being always in great abundance, these little bushy-tailed things go off at a certain time into a nest of leaves, and doze away for weeks, whilst their fellows are scampering around them during the moonlight nights, and imitating them in their sleep whilst all nature glows in the tropical sun. In temperate climates where there is a winter, this long sleep is called wintering, or hibernating, and in the hot climate it is called the summer sleep, or æstivation.

Why some animals should do this and others not, why some should sleep long in winter, and others in summer, and why all should be most regular in their time of taking their nap, are questions well worthy of any one's attention, and especially because they cannot be answered. Some of the hibernating animals awake for a little time now and then, and take food, but others get quieter and quieter, their breathing becomes slower and slower, their heart beats with diminished force and rapidity, and their temperature falls; but, on the other hand, the irritability of the muscles, especially of those of the heart, increases; and in these—for instance, in many of the Bats—the hibernation is not a commonplace, long-continued slumber, but a necessary matter, and the awakened sleeper dies.

Let us notice what takes place in the hibernators. They get into a place out of the light, and where the temperature is tolerably equable, and after having got nice and fat previously, they settle down in different positions, according to their shape, and go to sleep. They avoid too cold places, and get out of the range of the action of frost. Now taking no food, breathing very slowly, with very slow pulses, and indulging in no exercise, there is very little exhaustion going on. The quantity of fat stored up by the animal in its body generally consumes away, but very tardily, for the oxygen in the blood is at its lowest ebb, and the arterial blood resembles that of the dull purple veins. Under ordinary circumstances, if the whole of the blood is in this condition, the muscles of that side of the heart which propels the pure blood throughout the frame lose their power of contraction, and death ensues. But in their hibernating condition their irritability is increased, and they pump the impure blood as well as they did the bright scarlet fluid of old. At last the fat is consumed, the animal gets thin, and by the time the spring comes it is ready for its new life.

Now the little *Cheirogales* of Madagascar certainly do part of all these wonderful things. They get fat, and their tails attain a most dignified size; then they retire for their summer sleep, grow thinner and thinner, and finally come forth with such miserable vestiges of tails, so thin and miserable-looking. Their time of quietude is during the hot and dry season, and is equivalent to the English winter, and they fatten up during the months when the warm rain makes everything to grow in profusion. It must be noticed that although these Cheirogales greatly resemble the Lemurs already described, they have no special construction which necessitates this sleep.

These Cheirogales resemble the Hapalemurs in shape, and may be known by their small size, their long tail, which is either conical or cylindrical, and by their face, which is scarcely narrower in front than behind. Having long ankle-bones, the back muscles of the leg have a great leverage over the foot, which enables the creature to make its easy jumps. Being nocturnal in their habits, they have very large eyes, and rounded and short, but sharp-sensed, external ears. They are vegetable feeders, yet most of them are extremely fond of something alive to eat, and, indeed, are greedy enough when

* χείρ (hand), γαλῆ (weasel).

they have the opportunity of catching insects. Having wonderful powers of sight, and of rapid jumping, they watch for their prey, and approach it quietly, and finally descend from some height with the stealthy swoop of an Owl, catching the Beetle, Spider, or even small bird, and tearing it to pieces with astonishing celerity. They have a shrill cry at night, which is loud for such small creatures, but their usual voice is soft.

Holes in trees are used by the Cheirogales for hiding-places and nests for their young, which do not accompany the mother at first out of their safe retreats.

Naturalists have had a vast amount of trouble in distinguishing these little Lemuroids one from

FORKED-CROWNED CHEIROGALE. (*Modified after Schlegel and Pollen.*)

the other, and there has been a vast amount of confusion about their names, but the following are interesting for many reasons.

THE FORKED-CROWNED CHEIROGALE.*

The "Walouvy," or "Tantaroué-léla"—for such are its Malagasy by-names—is found in abundance in the forests on the western side of the island, but it equally inhabits the eastern parts of Madagascar. Their choice of a domicile is ordinarily in the hollow of a tree, particularly in one with a double aperture; and in their selection they not unfrequently stumble on a cavity already occupied by Bees, but this does not deter them from having a share in the busy business concern. For the natives pretend that it has a preference for the society of the Bees, doubtless with an eye to the dainty luscious honey, which it steals as opportunity offers. They make incredible leaps, so that it is extremely difficult to capture them. At night their cries resound in the woods almost continuously, and their noise somewhat resembles the piercing tones of the Guinea-fowl, a kind of "Ka-ka-ka-ka" being uttered loudly and precipitately.

* *Cheirogale furcifer.*

The name of this species comes from a dark brown streak which passes along the whole length of the back, and over the head, to fork into two bands—one over each eyebrow. Whatever may be its liking for honey, it has the means of biting hard fruit, for it has large middle front teeth, and also a strong first upper false molar. As a whole the teeth number the same as in the first division of the American Monkeys.

COQUEREL'S* AND THE DWARF† CHEIROGALE.

Another of these little Lemuroids, called Coquerel's Cheirogale, is celebrated as a nest maker, for it gathers dead leaves, and twigs, and grass, and makes a comfortable nest of large size, for it is a foot and a half in diameter. It goes into it by day, and sleeps soundly whilst the sun is up, but comes out at dusk to leap, crawl, and swing amongst the trees, looking out for live food quite as much as for fruit.

M. Milius, who was Governor of the Island of Réunion in 1821, gave a pair of little Lemuroids, each being about nine inches in length, with a long tail, to the Jardin des Plantes, at Paris. They lived there for some time, and used to get out of their cages at night and wander about the rooms and places where the beasts were confined. At dusk, after having been very quiet all day, they got up and stood well on their hind legs, and began to jump to and fro like mad creatures, and they kept it up when the room was quite dark, for they could be heard rushing about amongst a crowd of cages tenanted by other animals; but if the least light were admitted they darted through a small hole which led to their own cage, and were there again in the twinkling of an eye. They had beautiful silky fawn-coloured fur, and rolled themselves up in balls during the daytime, for the light seemed to be especially painful to them. In their captivity they were fed on bread, biscuits, and fruit.

One of the Cheirogales has a black circle around the eyes, and is called the Spectacled Cheirogale, and it is interesting because it is the species whose summer sleep has been noticed, and because it has an extremely important tail. This tail thickens greatly at the root, and tapers towards the end, not being cylindrical throughout, and it is the root which gets grossly fat, and finally excessively thin.

The last kind to be noticed is sometimes called the Madagascar Rat, or the Dwarf Cheirogale, for it is only four inches long, with a tail of six inches, and it might be passed by as only interesting for its small size and Rat-like look, but it has a most resplendent eye. The tapetum, or coloured tinsel-looking glaring structure situated deeply in the eyes, is so large, and the eye admits so much light at dusk, that quite an unnatural brilliancy is produced. They are night hunters, and are quiet and good-tempered when kept in cages.

They make true nests, like those of the crow, which consist of small interlaced twigs, in the midst of which there is a depression, with a bed of hairs for the young.

All the Cheirogales come, of course, from Madagascar, and they appear to inhabit the northern part of the island, and the east and west coasts, but not the south. They complete—with the exception of the curious Aye-Aye, which will be described at the end of this notice of the Lemuroida—the Madagascar Lemurs, and it is a point of interest to know that they are the only Madagascar Lemuroids which are pretty closely allied, so far as construction and shape are concerned, with any of the African kinds, which will now demand attention. Indeed, they and the Galagos of Africa have much in common, and are readily distinguished from the Indris and other Lemuroids already noticed. For instance, both have the long heel, or ankle-bone, the same number of teeth, and both have four teats, or mammæ—two on the breast, and two on the groin. They have no ruffs and no ear-tufts, and their brain is more triangular in shape than that of any other of the Lemuroida.

* *Cheirogale Coquerellii.* † *Cheirogale nain.*

MAHOLI GALAGO AND THE SENEGAL GALAGO.

CHAPTER XVI.

THE LEMUROIDA (*concluded*)—THE GALAGOS.*

THE GALAGOS—DEMIDOFF'S GALAGO AND THE MOUSE GALAGO—THE SENEGAL GALAGO—THE SENNAAR GALAGO—THE MAHOLI GALAGO—THE GRAND, OR THICK-TAILED GALAGO—MONTEIRO'S GALAGO—THE AFRICAN SLOW LEMURS—VAN BOSMAN'S POTTO—GENUS ARCTOCEBUS, OR BEAR MONKEY TRIBE—THE ANGWÁNTIBO—THE ASIATIC SLOW LEMUROIDS—THE SLOW LORIS—THE SLENDER LORIS—GENUS TARSIUS—THE SPECTRE TARSIER, OR TARSIUS—THE MALMAG—GENUS CHEIROMYS—THE AYE-AYE—The Puzzle of the Naturalists—Opinions regarding it—Specimen Examined by Owen—Feeding—Teeth—Hands—Classification of the Lemuroida—Geographical Distribution.

THESE Galagos are most interesting, lively creatures, and they have wonderful ears, which are long, large, and elliptical, and can be furled up if the animals become frightened. Moreover, they have a long heel-bone, and the tail, often bushy, either equals or is longer than the trunk.

* *Galago.*

DEMIDOFF'S GALAGO AND THE MOUSE GALAGO.*

The distinction between these kinds is not very definite, but they are inhabitants of the West Coast of Africa, namely, Senegal, Calabar, and the Gaboon. The Rev. W. C. Thomson's account in a letter to Mr. Murray of what he suspects to be really and truly *G. Demidoffii* and *G. murinus* is well worth quotation. "Young ones of both species were brought to us about this period of the year (July 26). Mr. Robb has a young specimen of the smaller species just now, and about this time last year I became possessed of one of the larger. It is a most interesting and amusing pet, not only quite tame, but manifesting strong attachment. I had it for about six weeks in my possession, when, unfortunately, both for myself and it, it took a false leap into a water-canal and was drowned. It was a very epitome of zoology, of the size and colour of a large Rat; it had the tail of a Squirrel, the facial outline of the Fox, the membranous ears of the Bat, the eyes and somewhat the manners of the Owl in its cool odd way of peering at objects, the long slender fingers of a lean old man, who habitually eats down his nails, and all the mirthfulness and agility of a diminutive Monkey. It hated its cage at night, but delighted to leap upon the bars of the chairs ranged purposely round the table for it. It could clear a horizontal distance of at least six feet at a leap; and whenever it fell, as during its short apprenticeship it often did, and from alarming heights too, it gave expression of its apparent chagrin by a rough sort of purring. It possessed a curious power of folding its membranous ears back upon themselves, and somewhat corrugating them at pleasure; and it appeared to me that the palms of its hands and feet were endowed in some degree with the power of suction, such as the Walrus is said to possess in perfection. I have seen it maintain itself in positions where the mere lateral pressure of its limbs appeared to be inadequate for the purpose. I once applied it to the side of a cylindrical glass shade, of which it could not embrace so much as a third of the circumference, and sure enough it maintained its position for some time, gradually sliding down until it gave way. The palm was very much depressed, always clean and glistening, surrounded by five papilliform growths, those near the roots of the fingers serving as points of opposition to them, the fingers never closing beyond the palm. Mr. Robb had one of your species (*G. murinus*) in his possession for a considerable while. It devoured Grasshoppers, and even the fierce Mantides (leaf insects), greedily, as well as Moths, little as it was; but I never saw my kind muster courage enough to attack a Grasshopper or *Mantis*, though nearly twice as large as Mr. Robb's. No doubt mine would, by-and-by, have become less particular and more daring. The smaller species was very familiar, and used to run over people with perfect freedom. A favourite place of refuge was under his whisker, and between it and his shirt collar." According to the same correspondent, the little ones breed in captivity, but never grow more than about three or four inches long in the body; the larger kind, he says, within a year grow to six or seven inches long, or equal to a big Rat. Their voices differ, the larger animal's tone being lugubrious. He further says that the little creatures (*G. murinus?*) are gregarious or social in their wild state, travelling in small companies, and inhabiting a common nest, one of which he himself got a glimpse of. He saw several individuals rush out of it as he passed, and it answered in its situation and description to the account he had received of them, which was, that they were built on suitable forks of trees, with a foundation of clay and superstructure of dried leaves.

EARS OF MAHOLI GALAGO, CONTRACTED AND OPEN.
(*Original after Murie.*)

THE SENEGAL GALAGO. †

This is interesting from being the earliest known species of true Galago, and also as apparently having the widest range of geographical distribution. It is but a very little larger than the full-grown

* *Galago Demidoffii and Galago murinus.*

† *Galago senegalensis.*

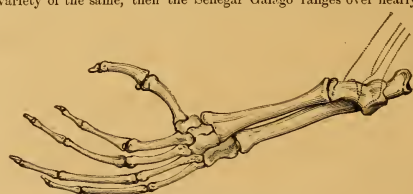
species mentioned above, and has fawn-grey fur above, and yellowish-white beneath, with dark-brown feet and tail, and a white stripe on the face. It is common in the Senegal forests, even to the borders of the great Sahara Desert. Its habits in no way differ from the other Galagos', though it is asserted that when pressed by hunger it feeds on the gum-arabic, plentiful in the acacia trees of its native forests. Its eagerness in the capture of insect prey is well attested. It pursues Beetles, Sphinges, and Moths with great ardour, even while they are on the wing, making prodigious bounds at them, and often leaping right upwards to seize them. Should it by chance miss its object and accidentally fall from the branch to the ground, it re-ascends with the rapidity of flight to renew the hunt. In captivity it freely eats chopped meat, eggs, and milk. Although good-tempered in confinement, it nevertheless is vivacious and petulant. At night it is always on the move, and if the occasion arises, darts off to the woods without a moment's delay. The Moors say its flesh is good eating.

THE MUSCLES AND TENDONS OF THE TAIL OF GRAND GALAGO.
(*Modified after Murie and Mivart.*)

The so-called Sennaar Galago* by some is held to be a different species, but by many is only deemed a variety of the preceding. This animal is plentiful on the wooded banks of the White Nile, and is spread over the forest tracts in Kordofan, and in the same latitudes to the Blue Nile in Sennaar, bordering Abyssinia. By the native name, "Camimdi," it is also well known in the interior of the East African Coast, viz., above Tete near the Zambesi River. If, moreover, the Maholi Galago, as certain authorities believe, is but a variety of the same, then the Senegal Galago ranges over nearly three-quarters the length and breadth of Africa.

THE MAHOLI GALAGO.†

Originally discovered and described by the late Sir Andrew Smith in his "South African Zoology," this is one of the most charming and interesting little creatures imaginable. The general colouring of the upper parts is a yellowish or brownish-grey, with slightly darker brindling on the back, a broad nose-streak, cheeks and throat white, and a tinge of yellow intermixed with the white of the belly and inside of the limbs. The great tender-looking eyes are of a deep topaz yellow; the ears, flesh-tint inside and downy-white outside, are very big, and betimes are rapidly folded together like those of Garnett's Galago, giving the creature great variety of expression. The head is somewhat globular,



FOOT-BONES OF GRAND, OR THICK-TAILED GALAGO.
(*Altered after De Blainville.*)

* *Galago sennaariensis.* † *Galago maholi.*

with a short, high, almost pointed nose. The delicate woolly fur of the body lengthens and darkens on the tail, most so towards its end. Smith observes that they spring from branch to branch, and tree to tree, with extraordinary facility, and always seize with one of their fore-feet the branch upon which they intend to rest. In their manners they manifest considerable resemblance to Monkeys, particularly in their propensity to the practice of ridiculous grimaces and gesticulations. It spends the daytime in the nests which it forms for itself in the forks of branches, or in the cavities of decayed trees; and in these nests the females also produce and rear their young, of which there are generally two at a birth. Sir John Kirk found it common among the hills of Kebrabassa, Batoka, and Nyassa, in East Africa. He says, singly and in pairs they came about the camp-fires at night, and in the dim light resembled a Bat in movements, by crossing from side to side, at single leaps, distances of six feet. A pair which lived a few years ago in the Zoological Gardens were a most interestingly tender couple. The day saw them nestled lovingly in their little box, and as night wore on they would peep out and cautiously and by stealth venture into their more spacious cage. Creeping down the branch, which served as a ladder, so noiselessly that not a movement could be heard, they would suddenly spring hither and thither, not like ordinary quadrupeds, but in a manner only to be compared with the leap and dart of a Tree Frog (*Hyla*). Approaching a dish of Meal-worms laid out for them, they would snap them up with their forepaws so quickly that the eye could not follow the motion; this rapidity of action equalled the Chamæleon's tongue, whose protrusion and withdrawal baffles the eye, the fly gone being the main fact the observer is cognisant of. They seemed heartily to enjoy the Meal-worms, these being dainties in comparison with their ordinary food, which was sopped bread, rice and milk, and fruit. They were much more timid creatures than the impudent, rollicking Garnett's Galago,* whose habits were noticed in the beginning of our description of the Lemuroids. Neither were they by any means as noisy; indeed they seldom if ever uttered a sound, and that was only a subdued warning note. As regards their Monkey-like gestures, hinted at by Smith, this pair never showed any, their manner being rather Squirrel-like than otherwise. Occasionally a hasty contraction or curling together of each capacious ear simulated the scared grimace of a Monkey, but this action was one of surprise or timidity, and not that of the drollery and mischief of Monkey habit. On the whole, these Maholi Galagos appear to be animals of lower intelligence than the Monkey tribe.

MONTEIRO'S GALAGO.
(*From a Photograph by Mackie.*)

THE GRAND, OR THICK-TAILED GALAGO.†

This handsome animal comes from both East and West Africa south of the Equator, and is about as large as a Cat, with a great bushy tail some three or four inches longer than the body. This appendage it carries aloft very majestically, or swerves it to and fro as a kind of rudder in climbing, occasionally sweeping it along the back and belly, or curling it around the body after the manner of

* This species, which intervenes between the Maholi and Grand Galago, we have already figured and described (see pp. 215, 216).

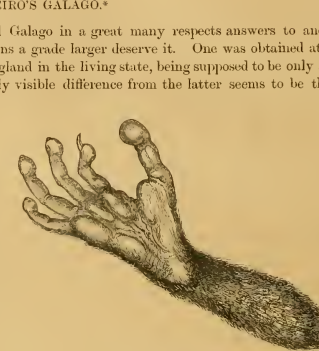
† *Galago crassicaudatus* (Geoffroy).

the Lemurs. Being nocturnal in its habits, the eyes, which are large, and with great wide dark pupils and a brown-red iris, have a glassy, glimmering appearance in daylight, but look like balls of fire at night. The ears are a remarkable feature: about a third shorter than the head, they stand out like great, flattish, elliptical-mouthed trumpets, ever changing position and shape, and catching all sounds, and they are nearly bare within and slightly hairy outside. This animal has fur of a uniformly dark brown, and this colour mainly distinguishes it from

MONTEIRO'S GALAGO.*

This short description of the Thick-tailed Galago in a great many respects answers to another, which merits the title of "Grand," if dimensions a grade larger deserve it. One was obtained at Cuis Bay, south of Loanda, and was conveyed to England in the living state, being supposed to be only a pale variety of the last-mentioned species. The only visible difference from the latter seems to be that of

PALM OF HAND OF GARNETT'S GALAGO.
(*Original after Murie.*)



SOLE OF FOOT, WITH LONG HEEL, OF GARNETT'S GALAGO.
(*Original after Murie.*)

colour, even this slightly varying. It is of a light chinchilla-grey all over, save the tail and the throat, which are nearly white. The nose is black and bare, and the feet are deep brown. The entire length of the animal is twenty-eight inches, whereof the tail is sixteen. The ears are a couple of inches long, and blackish. Mr. Bartlett remarks that when these are thrown forwards they give the head a resemblance to that of the Aye-Aye; but when they are folded back and down the physiognomy approaches that of the Douroucouli. Sir John Kirk (who accompanied Dr. Livingstone) says: "While the *G. maholi* is peculiar to the interior, where its geographical range seems to be great, the other, or Great-tailed Galago (*G. Monteiri*), is confined to the maritime region—so far as I know, never penetrating beyond the band of wood known generally as the mangrove forests. By the Portuguese it is named 'Rat of the Cocoa-nut Palm,' that being its favourite haunt by day, nestling among the fronds; but if it be disturbed, performing feats of agility, and darting from one palm to another. It will spring with great rapidity, adhering to any object as if it were a lump of wet clay.

"It has one failing—otherwise its capture were no easy task. Should a pot of palm-wine be left on the tree, the creature drinks to excess, comes down, and rushes about intoxicated. In captivity they are wild; during the day remaining either rolled up in a ball, or perched half asleep, with ears stowed away like a Beetle's wing under its hard and ornamented case (elytra). I had half a dozen Squirrels with one in the same cage; these were good friends, the latter creeping under the 'Golgo's' soft fur and falling asleep. On introducing a few specimens of Shrew (*Macroscelides tetradactylus*), the 'Golgo' seized one and bit off its tail, which, however, it did not eat. The food it took was biscuit, rice, orange, banana, guava, and a little cooked meat. Stupid during the day, it became active at night, or just after darkness set in.

* *Galago Monteiri* (BARTLETT).

"The rapidity and length of its leaps, which were absolutely noiseless, must give great facilities to its capturing live prey. I never knew it give a loud call, but it would often make a low chattering noise. It has been observed at the Luabo mouth of the Zambesi, at Quilimane, and at Mozambique. When I had my live specimen at Zanzibar, the natives there did not seem to recognise it; nevertheless, it may be abundant on the mainland."

Mr. Monteiro tells us that the Loanda specimens have not the character of being such a drunken lot of creatures, though they are arrant thieves, but otherwise he corroborates Kirk's observations. He mentions that they come in bands, and rob the fruit-trees of the villages. Their flesh is looked upon as good eating, and their skins are eagerly sought for, the fur being used to staunch wounds.

POTTO IN ITS SLEEPING AND WAKING ATTITUDES. (*Modified from Alph. Milne-Edwards.*)

In allusion to the Galago's inebriety, Dr. Gray relates that a friend of his gave a half-grown Scotch Terrier to a distiller, who soon returned it with the character of "habit and repute." The animal could not by any correction be prevented from drinking the spirit as it came from the still, or any spirits it could get, and it would stagger and reel about, verifying the term, "a drunken dog," so often applied to divine man.

THE AFRICAN SLOW LEMURS.

The rest of the African Lemuroids have not the habits, appearance, and anatomy of the Galagos, and are a very sad, weird, slow-going set, totally different from the active, careless kinds already noticed. A world of care seems to hang around their deliberate movements; they are images of Sleepy Hollow; they never are seen to spring and rush about, but ordinarily conduct themselves with great gravity and decorum. Slow they are, and hence their name the Slow Loris, and their body and limbs are not made for rapid locomotion. The limbs are nearly equal in length, their head is globular, and the eyes are uneven. The short ears and short fur are all of a piece, and so is the short tail (for this is most common), and the short second or index (counting the thumb as one)

finger. The back or rib vertebræ are fourteen or more, and the loin-bones are never less than seven. There is a remarkable division of the blood-vessels of the arms, loins, and legs called the *rete mirabile*. The vessels split into minute tubes, like hairs in calibre, but of two sizes, and lie closely adherent to each other in long parallel lines (see page 245); this arrangement, also termed a plexus, or plexiform, being similar in kind to what is met with in the Sloth tribe of South America. The Slow Lemurs inhabit both Africa and Asia, but are not found in Madagascar, and their mode of life is strictly arboreal and nocturnal.

The first African genus is *Perodicticus*.

ANGWÀNTIBO. (*Slightly altered after Huxley.*)

VAN BOSMAN'S POTTO.*

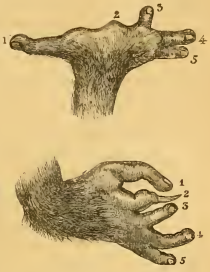
As far back as the year 1705, while on a voyage to the Guinea coast, the Dutch navigator, Van Bosman, came across a new and strange little quadruped which, on his return, he figured and briefly described under the name of Potto. The colonists knew it as the Bush-dog, and that it was slothful and retiring, seldom making its appearance except in the night-time, and then to feed on the cassada and other vegetables. It is remarkable for its singular hand, which has, as it were, a deformed fore-finger, and for a seeming protrusion of the neck-bones.

Like other tropical night-animals, the home or wild habits of the Potto have only been loosely studied. It is not restricted to the northern parts of Guinea, but is found on the Gold Coast and at the Gaboon River under the Equator. It shows a certain agility at night, clambering up the most smooth and polished branches with ease. When caught, and in captivity, one authority says, it sped along the cornices and angles within the house wherever there was the least elevation from the wall.

Those specimens which have lived in the Regent's Park Gardens from time to time have fed on

* *Perodicticus potto.*

the same kind of food and exhibited no special differences of habit from the Slow Loris of Asia, presently to be described, if we except a more intractable disposition; for they have seemed rather addicted to giving an ugly bite whenever attempted to be handled, however gently. Mr. Bartlett managed to get one that showed a more amiable disposition, courting kindly stroking. When first obtained, it was so young that doubts were entertained of its surviving, especially as it suffered from the cold weather. To obviate this a small bag of hare-skin was made, fur inside, and Master Potto was placed therein. Furthermore, a bitch having whelps on the premises, one of the latter was put in with the young African for a while, then another, and so on in rotation, the animal heat of Potto being duly sustained. The latter clung to the puppies as it would to its mother, hugging them on the belly so tight that the doggies did not quite seem to relish their forced companion. This nursing, however, did well, and Potto was duly reared, and became on the whole good tempered.



HAND AND FOOT OF ARCTOCEBUS. (*After Huxley, Zool. Soc. Proc.*)

Mr. Skues records having purchased a female at Cape Coast on the 31st March, 1869, along with its young one, which had been born on the 8th February. They slept all day; the mother usually perched on a door, with the youngster clasped to her belly, by its fore and hind extremities. At dusk they came down and wandered about the room all night. After a time, young Potto scampered hither and thither on his own account. Milk and bread they refused, but would feed on pine-apples and bananas, with water. Although there were insects about the room, as is the case always in tropical climates, the Pottos were never detected eating them, but one day the mother was found busily munching at a tray of preserved Beetles. At Accra, circumstances prevented due attention being given them, and there the young one died aged twenty-two weeks. The mother survived only six weeks. The negroes seemed to be much afraid of the Potto, which they called "Aposo," or "Aposou." It inhabits West Africa and the coasts of the Gulf of Guinea.

The hairs on the Potto are longish, soft, and woolly, mouse-coloured at the base, rusty in the middle, and paler tipped. Hence results a general chestnut tint, with intermixture of grey, the under surface being considerably paler. The limbs are nearly of one length; the head rounded, with slightly-hairy shortish ears, and moderately-projecting muzzle. The nose and chin are almost naked and flesh-coloured, the former grooved or nicked in the centre. The eyes are lateral and oblique, very convex, and with an oblong pupil. The index, or first finger, is very short, resembling a tubercle.

The nature and number of the teeth indicate a mixed diet, as there are four incisors above and below, and two canines in the upper and lower jaw. Then come three pre-molars and three lower grinders on each side in both jaws.

GENUS ARCTOCEBUS, OR BEAR MONKEY TRIBE.*

The next genus is very singular. The species has just the trace of a tail, and the index finger is reduced to a slight projection, or tubercle, on which there is no trace of a nail, and the fingers and toes about the lower joints are united by skin. The ear has two cross folds, and there are fifteen dorsal back-bones, and seven in the loin region.

THE ANGWÁNTIBO.†

Our knowledge of this curious African species, which comes from West Africa and Old Calabar, truly a "three-fingered Jack," is due to the Rev. A. Robb, when missionary at Old Calabar. From his

* A very surprising term, as it applies to a Lemuroid.

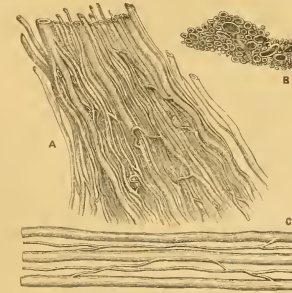
† *Arctocebus calabarensis.*

letter (December, 1859) accompanying the bottled specimen first transmitted to England, we gather the following history:—"The Calabar people call it *Angwántibo—angwán* means a farm, but we do not know the etymology of the second part of the word, and cannot say whether it arose from any habit peculiar to the animal. It lives in trees; but, being nocturnal, the people know exceedingly little about it. They cannot tell what it eats. A lad whom I asked said that he lived in the house, and it lived in the bush, how then could he know anything about it? My Krumen also recognised it as a

SLOW LORIS. (*After Tickell and Alph. Milne-Edwards*).

countryman of theirs. They consider the one sent as a young one, and say that in their country it grows to the size of a common puss. Probably theirs is a different animal, but I cannot tell. They call it *Dwán*, and say that it lays down the law to the other beasts, forbidding them to eat the young fruit when it begins to form on the trees. If the Monkey transgresses, the *Dwán* seizes him, and holds him there till he dies—yea, the Monkey rots in his grasp. They say they are shot together thus. If the Monkey gets the shot, the *Dwán* holds on; if the *Dwán* gets the shot, they fall together. The Krumen say that the *Dwán* eats fruit. This is all we know about it at present; and their (the Krumen's) account seems somewhat fabulous."

Dr. Alexander Smith describes and compares the animal with the Potto. He mentions the following characters:—Above, yellowish-brown, the roots of the hairs, dark grey; below, paler, in some parts nearly white; hair, wool-like; length from muzzle to point of tail. $10\frac{1}{2}$ inches, the tail being only a quarter of an inch long. The body is slender; the head oval and rounded, with a blunt but protuberant face; the eyes, full and large; ears, naked within, and with short hairs externally; nostrils, sinuous, and laterally placed; there is a projecting fold beneath the tongue, as in other Lemuroids, and the neck is short. The limbs are slender, the hinder a trifle larger and stronger than the others; both feet and hands conform to those of the Potto, with, however, a still greater reduction of the index finger. He observes that the hands and feet are divided, as it were, into two opposing portions, which he likens to the grasp of such climbing-birds as the Parrots. This peculiarity, along with the multiple blood-vessel division of the extremities, he thinks indicative of long-enduring muscular action, stealthy step, and adaptation for gripping twigs of trees, rather than for the purpose of capturing a prey.



RETE MIRABILE. (*Original after Murie.*)

Greatly magnified, and partly diagrammatic representations of a *Rete Mirabile*. A. General appearance. B. Cross section of vessels. C. How the capillary vessels of two sizes join.

The anatomical peculiarities of the Angwántibo have been lucidly described by Prof. Huxley in the "Proceedings of the Zoological Society," where, from his examination, he substantiates Dr. Gray's separation of the animal generically from its African mother the Potto.

THE ASIATIC SLOW LEMUROIDS.—THE SLOW LORIS.*

There are two well-marked kinds of these Lemuroida to be met with in very large districts in the East, and they live in the tropical woods of Eastern and Southern Hindostan, Ceylon, Burmah, Siam, Cochin China, the Malay Archipelago, and in the great Islands of Sumatra, Java, and Borneo. But they do not live together in the same parts.

SLOW LORIS. (*From a sketch by Tickell.*)

The first to be noticed has the widest geographical range, and is to be found here and there from Hindostan to China, and from Burmah to the great islands. Hence quite a voluminous history is attached to this animal, whose singular appearance and habits, peculiar anatomy, and geographical distribution, have been the fruitful theme for travellers and naturalists of most European nations. He is called by many names, and is the Bashful Billy—"Chirmundi Billi"—of the Bengalese, or the Slow Lemur, and naturalists term him the Slow Loris, or Kukang (*Nycticebus tardigradus*). When he is turned out of his quarters in the daytime, he reminds one of a very young, awkward, puppy without a tail. But his eyes, however, are enormous and owl-like, and seem to start protuberantly forwards with an unmeaning stare. When his wits return, and the scare ceases, he softly turns on his heel, and with a very slow, measured pace—hand-over-hand, as sailors term it—makes for his box. There is a cool, sedate manner about his whole proceedings which may either be taken for wisdom or stupidity. During the night, when hungry cravings send him forth on his

* *Nycticebus.*

own account, his eyes light up, and he seems more alive to his interests, though seldom increasing the activity of his movements. On a table he waddles like a sailor newly ashore, but with a rope or bough to grasp, by foot or hand, there ensues a grip like a vice, a steady mode of ascent putting him betimes out of reach of danger.

The eye of the Kukang, besides its adaptation to nocturnal vision, in the presence of a tapetum, or silvery lining to the choroid or blood-vessel layer, has also a singular manner of closing. Instead of the eyelids shutting from above downwards, as in the majority of Mammals, they approach obliquely outwards and inwards. This mode of closure is entirely due to an inequality in the fleshy fibres which surround the eyelid, and, together with the large pupil, somewhat elliptical in shape, produces in daylight a very strange, unmeaning look. It has a very odd knack of hanging to boughs, body downwards, and the way in which it is done, asleep or awake, apparently receives explanation from the mode in which certain of the flexor muscles are fastened above the knee-joint. Thus, by simple bending of the leg, the toes are drawn (on bending) together, and hold fast without any sensible muscular exertion. The mechanism, in fact, is similar in kind to that which enables birds to perch while slumbering, or by which Bats adhere to crevices while suspended head downwards. It possesses the peculiar *rete mirabile* of blood-vessels already noticed.

Many anecdotes respecting the habits of the Nycticebus in confinement have hitherto found currency, a similar vein of narrative running through each. One kept by Mr. Baird some nine months had a preference for veal, fresh-killed fowls' necks, sugar, and gum-arabic, cooked meat being abhorred. Instead of recounting old stories, we append the following observations of Captain Tickell, not hitherto made public :—

"This animal is tolerably common in the Tenasserim provinces, and in Arracan, but from being strictly nocturnal in its habits is seldom seen. It inhabits the densest forests, and never by choice leaves the trees. Its movements are slow, but it climbs readily, and grasps with great tenacity. If placed on the ground, it can proceed, if frightened, in a wavering kind of trot, the limbs bent at right angles, like a mutilated Spider. It sleeps rolled up in a ball, its head and hands buried between its thighs, and wakes up at the dusk of evening to commence its nocturnal rambles. The female bears but one young at a time. In confinement they are at first savage, bite severely, and in spite of general slow movements, can do so pretty quickly, uttering a rough grunt or growl. They, however, get quiet, if not absolutely docile, in time, and are kept without difficulty, requiring no other diet than plantains, or any other kind of fruit. They become content to remain in the smallest box, where another animal would soon pine and perish for want of exercise. When for a time confined they readily abandon their nocturnal habits, eat during the day, and rest at night. They will thus remain contentedly on an old punkah hung in a lumber-room, for many days; but, unless thoroughly reclaimed, they will always seize an opportunity during night to escape, never travelling far, however, and generally turning up in some thicket or bamboo-clump, or other quiet corner in the grounds. They greedily devour all sorts of insects, and also birds' eggs."

On one occasion Captain Tickell watched an individual crawling along the floor to seize a Cockroach. When it had approached within ten or twelve inches, it drew its hind feet gradually forwards until almost under its chest; it then cautiously and slowly raised itself up into a standing position, balancing itself awkwardly with its uplifted arms, and then, to his astonishment, flung itself, not upon the insect, which was off "like an arrow from a Tartar's bow," but on the spot which it had, half a second before, tenanted (see woodcut). This is its manner, however, of catching such of its living food as will wait long enough. Grubs, Caterpillars, and the slower Beetles (*Scarabæi*) are seized in one or both hands, and slowly carried to its mouth, and there solemnly munched up; the Nycticebus looking all the time, with its delicate small muzzle and its protuberant eyes, like one of those apologetic pigmy Lapdogs ladies love to carry. It is almost wholly silent, but when roused to take food, now and then it utters a feeble tone, like the crackling of some substance in the fire. When angry, and about to bite, it gives forth a tolerably loud growl or grunt.

The above animal (with one or possibly two species) forms the genus Nycticebus, in which the body and limbs are short; there is no tail, and the head is globular, whilst there are no less than sixteen back-bones with ribs. The index finger is short, and there is a nail on it.

The next genus is called Loris, or Stenops.

THE SLENDER LORIS*

Comes from Ceylon, Malabar, and the Coromandel Coast, and the Malays in Ceylon call it "Seyvoingoo," the Cinghalese, "Onaha ppoolowa." The meagre figure and long lank limbs of this creature give it a droll, half-starved look, its skin-tight robes and silent melancholy lending oddity, but not gracefulness, to its charms. If seen during the day, and made to walk on a flat surface, what between its blinking, peeping eyes and awkward gait, a feeling of pity devoid of admiration is apt to arise. But watched at night, when it is clambering among branches, its character changes to that of a more lithe and nimbler animal, whose great staring eyes and gliding progress most surely

SLENDER LORIS, SHOWING ITS ATTITUDES AND HABITS. (*In part after Emerson Tennent.*)

indicate a nature less apathetic than a more hasty conclusion would warrant. Its uncommonly long body, devoid of a tail, is rendered more striking on account of limb-length, and the colour is usually of an unequal sooty-grey, the back mingled with much rusty-tinted or tawny hairs. The under parts are whitish, and there is a light nose-streak. The space round the eyes, which are close together, is dusky, and on the head is a dark spot, pointing to the inner eyelid. As in other of the Lemuroid groups, there is no absolute constancy in depth of tint and markings, lighter and darker varieties being met with. The rounded ears are conspicuous, though not long and mobile as in the Galagos, and the face has a kind of Dog-like expression. The hair is very singular when the animal is alive; it resembles soft packed wool, somewhat curled and arranged in little tufts, as the hair on the scalp of the negro, but very delicate; it soon loses this appearance after death if much handled, as is always the case in removing the skin.

The Slender Loris is very common in the lower country of the south and east of Ceylon. Dr. Templeton, who had several of them, observes "that after a few months' confinement they soon begin to

* *Loris*, or *Stenops gracilis*.

pine and die. One was particularly noticed. If the room was perfectly quiet about dusk, it ventured about, crawling along the rails of the chairs with a very gentle movement. There was an interval of nearly a minute in the closing of its hands on the parts of the furniture which it grasped in succession, while moving its head from side to side with much grave deliberation. But when a Spider or other insect came within its reach, its clutch at it was quick as lightning, and with equal rapidity it was conveyed to the mouth. It seemed particularly anxious to avoid having its hinder excremities touched. When approached, it retiringly slunk along the stick placed slantingly in the corner for its use, or along the back of the chair, with the usual deliberate movement. Its great goggle eyes would be fixed immovably on your face or hands if held towards it, and with every expression of fear. Its mouth appears small, and so little distensible that one cannot imagine it capable of biting anything except it be of very small size. The natives, nevertheless, assert that it destroys Peacocks in the jungle, seizing them by the neck, which it clutches with such tenacity that the bird soon falls exhausted to the ground off its perch, or in its sudden flight, attempting to escape its persecutor. Having devoured the brain, the Loris leaves the rest of the body untouched." Among the others in his possession, Templeton alludes to a female which gave birth to a young one. "This latter, when ushered into the world, was about two inches long, like a Mouse, perfectly without hairy covering, a large head, attenuated body, and excessively slender legs. The face and eyes were proportionally much smaller than in the older animal. It clung to the mother so tenaciously, that I believe it would almost have parted with its life than let go its hold." This baby Loris, he remarks, was not at all entitled to the usual appellation, Dog-like.

Sir J. Emerson Tennent says that the Slender Loris, from its sluggish movements, nocturnal habits, and consequent inaction during the day, has acquired the name of the "Ceylon Sloth." According to him there are two varieties in the island; one of the ordinary fulvous brown, and another larger, whose fur is entirely black. A specimen of the former was sent to him from Chilaw, on the western coast, and lived for some time at Colombo, feeding on rice, fruit, and vegetables. It was partial to Ants and other insects, and always eager for milk or the bone of a Fowl. The natural slow motion of its limbs enables the Loris to approach its prey so stealthily that it seizes birds before they can be alarmed by its presence. During the day one which he kept was usually asleep in the strange position shown in the woodcut (p. 247), its perch firmly grasped with its hands, its back curved into a ball of soft fur, and its head hidden deep between its legs. The singularly large and intense eyes of the Loris have attracted the attention of the Cinghalese, who capture the creature for the purpose of extracting them as charms and love-potions, and this they are said to effect by holding the little animal to the fire till its eyeballs burst. Its Tamil name is *theivangu*, or "thin-bodied;" and hence a deformed child or an emaciated person has acquired in the Tamil districts the same epithet. The light-coloured variety of the Loris in Ceylon has a spot on its forehead, somewhat resembling the *namam*, or mark worn by the worshippers of Vishnu; and from this peculiarity it is distinguished as the *Nama-theivangu*.

A curious animal, differing from the foregoing Slow Lemuroids, but Asiatic in its distribution, is the only species of the genus *Tarsius*.

GENUS TARSIUS.—THE SPECTRE TARSIER, OR TARSIUS. THE MALMAG.*

This is a small, active creature, which appears to excite great terror in the minds of the natives of the East Indian Archipelago, from its curious-shaped face, and sudden appearance at dusk. So impressed are the inhabitants of some portions of Java with its malevolent influence, that if they see one of them on a tree near their rice-grounds, they will leave them uncultivated.

About the size of a small, common Squirrel, this tiny cause of fright has a round head, like that of a Marmoset, a pointed muzzle, large ears, and staring eyes. Its grinning mouth gives a queer and comical look to the face. Its body is about six inches in length. The limbs are long, especially the hind pair, and the tail—about nine inches long—is slender, and furnished with a brush of long hair at the end. The colour of the body is fawn-brown as a rule, and the bare parts

* *Tarsius spectrum* (GEOFFROY).

are of a flesh tint, and the forehead, face, and nose are reddish, and there is a black eye-streak. The name is derived from the fact of the "tarsus," or ankle-bones, being remarkably developed, the heel-bones being very long. There is but one kind as yet known, and it can be distinguished from all the other Lemuroids by the peculiarity of its front teeth. There are four upper ones and only two lower, and the inner pair of the upper jaw are much larger than the outer. There are four canine teeth; and there are twelve molar teeth in each jaw, six being false molars. These teeth are very crowded, and there is scarcely any space between them. The ends of the fingers and toes are well supplied with pads, which assist the animal in its jumping and clinging,

TARSIUS. (*Animal after Buchanan, but in detail from specimens in the British Museum.*)

and the second and third toes have short, sharp, and pointed claws, which stand nearly erect. The nails of the hands are scale-like and triangular, and this is the case with those of the great and outer toes.

The cavity for the eye, or orbit, is unlike that of any other of the Lemuroida, for it is closed behind, and does not open there on to the temple; this is, therefore, very characteristic. But the globular-shaped head, although remarkable, is not quite so distinctive. The most striking anatomical feature, and indeed that which is observable in the outside shape, is the disproportionate length of the heel-bones and foot to the lower leg and thigh. It has a very small side-bone to the leg (*fibula*), and it does not reach to the ankle. Oddly enough, the third finger of the hand is the longest, and the second and fourth are nearly equal, presenting a difference with regard to the other Lemuroida. So that this small, active creature, with a Monkey-like appearance, has more resemblance to the Insectivora, and differs very considerably from the rest

of the group with which it is classified. The Spectre Tarsier, which inhabits the Oriental Archipelago and the Philippine Islands, has not been brought alive to England, but the late well-known naturalist, Mr. Cuming, gave the following description of its habits and peculiarities:—

"The Malmag is a small animal living under the roots of trees, particularly the large bamboo of these islands. Its principal food is Lizards, which it prefers to all other. When extremely hungry I have known it to eat Shrimps and Cockroaches, and give a great preference to those which are alive. It is very cleanly in its habits; never touches any kind of food that has been partly consumed, and never drinks a second time from the same water. It seldom makes any kind of noise, and when it does emit sound, it is a sharp, shrill call, and only once. On approaching it in its cage it fixes its large full eyes upon the party for a length of time, never moving a muscle; on drawing nearer or putting anything near it, it draws up the muscles of the face similar to a Monkey, and shows its beautiful, sharp, regular-set teeth. It laps water like a Cat, but very slowly, and eats much for so small an animal. It springs nearly two feet at a time. It sleeps much by day, is easily tamed, and becomes quite familiar, licking the hands and face, and creeping about your person, and is fond of being caressed. It has an aversion to the light, always retiring to the darkest place. It sits upon its posteriors when it feeds, holding its food by its fore-paws; when not hungry it will ogle the food for a considerable time. A male and female are generally seen together; the natives of these islands make sure of taking the second having secured the first. They are extremely scarce in the island of Bohol, and found only in the woods of Jagna and the island of Mindanao. It produces one at a time. I had the good fortune to procure a female without knowing her to be with young. One morning I was agreeably surprised to find she had brought forth. The young one appeared to be rather weak, but a perfect resemblance to its parent; the eyes were open and covered with hair. It soon gathered strength, and was constantly sucking betwixt its parent's legs, and so well covered by its mother that I seldom could see anything of it but its tail. On the second day it began to creep about the cage with apparent strength, and even climb up to the top by the rods of which the cage was composed. Upon persons wishing to see the young one when covered over by the mother, we had to disturb her, upon which the dam would take the young one in its mouth, in the same manner as a Cat, and carry it about for some time. Several times I saw her, when not disturbed, trying to get out of the cage, with the young one in her mouth as before. It continued to live and increase in size for three weeks, when, unfortunately, some one trod upon the tail of the old one which was protruded through the cage, a circumstance which caused her death in a few days. The young one died a few hours after, and I put it in spirits."

GENUS CHEIROMYS.

Another Madagascar Lemuroid remains to be noticed, and it ought to have been described with those of that great island; but the creature is so unlike all the others, and is so manifestly inferior in its Lemuroid character, and peculiar in its construction and habits, that it is necessary to place it at the end of all. Its position in the scale of classification is at the end of the Lemuroida, for although it has many of their anatomical characters, it resembles the Rodents, or Gnawers, in others. It is called

THE AYE-AYE.*

This is one of the most remarkable animals in the world, both on account of its peculiar Squirrel shape and Lemur-like construction, as well as on account of its habits. The animal was first kept and described by the traveller Sonnerat, who obtained a male and female from the west coast of Madagascar. He kept them on board ship and fed them on boiled rice for two months, when they died, and he used to remark that they used a finger of each hand to eat with, after the fashion of the Chinese, who use chopsticks. Having shown them to some of the natives of the east coast of the island, they were surprised, and denied that these curious-looking creatures belonged to their part of the country; moreover, they ejaculated "Aye-aye" on seeing them, and thus gave the familiar name to the breed. It is now known that the so-called Aye-Aye chiefly inhabits the forests of bamboos, which are

* *Cheiromys Madagascariensis.*

numerous in the interior of the island. They are rare animals, and live a solitary life, or are found in pairs, but they never associate in bands of several individuals. They are essentially nocturnal in their habits, for they sleep all the day long in the thick bunches of leaves of the bamboos in the most impenetrable part of the forests, and they are therefore rarely seen, and are only met with quite by accident. The Aye-Aye feeds on the pith of the bamboos, and on sugar-canes, but it also loves Beetles and their grubs as a change of food. During the dark nights it awakens the echoes of the forest with a kind of plaintive grunting, and jumps from bough to bough, and clambers up the trees

AYE-AYE. (*After Owen, Trans. Zool. Soc., but modified.*)

with great agility and vivacity, examining the bark of old trees most carefully in order to find its favourite insect-food.

As daylight approaches, the Aye-Aye ceases its lively play and forest-roaming, and moves into the sombre shades of the densest foliage; there it avoids the light and the rays of the sun, and placing its head between the fore-feet, and encircling itself with its bushy tail, the now half-torpid creature sleeps on until the evening.

The Aye-Aye is about three feet in length, including the long tail, and there is a half Fox, half Lemur look about it, with a little of the Squirrel. The hind feet at first sight are like those of a Monkey, as are also the limbs; but the hands are not in keeping with the rest, for the fingers are of all kinds of lengths, and the middle one looks as if it were atrophied and wasted. A little care, however, proves that the ears, so widely open and spoon-shaped, and nearly naked, are larger than those of

these animals, that the head is really broader than theirs, and that the furthest end of the muzzle surmounts a perfect lip which hides four great front teeth, two above and two below. The tail is a very prominent object, and is longer than the body; it is straight, very bushy, flexible, and is covered with long coarse hairs, being thicker at the end than at the root. All the rest of the body, except the ears, nose, and the palms of the feet and hands, which are naked, is covered with a fur that is dense and furry underneath, and long and hairy at the ends; and it is these long hairs which give the general tint to the animal. The prevailing tint is a deep fuscous approaching to black; there is a little dark-red underneath, and yellow-grey on the throat nearest the head. Everywhere the dark colour is relieved by long scattered white hairs, which are very conspicuous on the back. On the back and tail the hair attains the length of from three to four inches. It has widely-open staring eyes, and whilst it is lively enough in the dark, it looks dazed and stupid in daylight. As if to render the animal more curious than ever, the teats, or mammæ for suckling the young, are not on the breast, but in the lower part of the body, and close to the groins, there being one on each side.

The Aye-Aye, so strangely constructed, has been a great puzzle to naturalists, and there have been many keen debates about its natural history. It is a hundred years since Sonnerat stated that, although the Aye-Aye much resembles a Squirrel, "yet it differs therefrom by some essential characters, being also allied to the Lemur and the Monkey;" and in describing the fore-foot, he specifies the long slender joints of the skeleton-looking middle finger, which the animal, he says, "makes use of to draw out of holes in trees the worms which form its food." Buffon saw the skin of one of these specimens obtained by Sonnerat, and concluded that it is more closely allied to the genus of Squirrels than to any other, and that it also has more relation to a kind of Jerboa. After describing the hind feet, Buffon remarks that the opposite character of the thumb with the flattened nail separates the Aye-Aye widely from the Squirrel, and that of all animals that have a flat great toe-thumb nail, the Tarsier, a kind of Jerboa, is that which most resembles it. He ranked the Aye-Aye with the Rodents, or Gnawers. Nevertheless, Cuvier considered it to be one of the Squirrels, and by no means ignoring the opposite hind thumb, he still believed it to be an unusual or anomalous kind, but he was greatly led by the belief that the animal gnawed wood invariably for the sake of its only food, the worms and grubs. About the same time a German (Schreber), by examining the limbs, decided that the Aye-Aye was a Lemur, and he called it *Lemur psilodactylus*, or the "bare-fingered" Lemur; and after a while Cuvier obtained the skull and part of the limb-bones from Sonnerat's specimen, and examined the first especially. Then the great front teeth of the Aye-Aye, and the space behind them, influenced the great anatomist, who saw that it had the teeth of Gnawers (Rodents), and skull like that of the Quadrumana, so he placed it in the list of doubtful animals. After his time, most anatomists considered the animal to be clearly allied to the Squirrels, and placed it amongst the Rodentia. But in 1859 Owen, from whose works the above notices of the progress of opinion on this subject have been taken, received an important letter from Dr. Sandwith, C. B., and a specimen of the Aye-Aye. The following letter explains the habits, and Owen subsequently described the anatomy of the animal, and placed it in its present position in the classification.

Dr. Sandwith wrote:—"After very great difficulty and much delay I have at length obtained a fine healthy male, a real Aye-Aye, and he is enjoying himself in a large cage which I had constructed for him. And now I have some questions to ask you. Do you want him dead or alive? It will, of course, be much easier to send his dead body home, if that will do; and if so, how am I to preserve him? If you want him alive you must tell me so without delay, as I think it would be dangerous to send him home in the cold season. I observe he is sensitive of cold, and likes to cover himself up in a piece of flannel, although the thermometer is now often 90° in the shade. He is a very interesting little animal, and from close observation I have learned his habits very correctly. On receiving him from Madagascar, I was told that he ate bananas, so of course I fed him on them, but tried him with other fruit. I found he liked dates, which was a grand discovery, supposing he be sent alive to England. Still I thought that those strong Rodent teeth, as large as those of a young Beaver, must have been intended for some other purpose than that of trying to eat his way out of a cage—the only use he seemed to make of them besides masticating soft fruits. Moreover, he had other peculiarities, *e.g.*, singularly large naked ears, directed forward as if for offensive rather than defensive purposes; then again the second finger of the hands is unlike anything but a monster supernumerary member, it

being slender and long, half the thickness of the other fingers, and resembling a piece of bent wire. Excepting the head and this finger, he closely resembles a Lemur. Now, as he attacked every night

FOREST SCENE IN MADAGASCAR.

the woodwork of his cage, which I was gradually lining with tin, I bethought myself of tying some sticks over the woodwork, so that he might gnaw these instead. I had previously put in some large branches for him to climb upon; but the others were straight sticks to come over the woodwork of his cage, which alone he attacked. It so happened that the thick sticks I now put into his cage were bored

in all directions by a large and destructive grub called here the Montorek. Just at sunset the Aye-Aye crept from under his blanket, yawned, stretched, and betook himself to his tree, where his movements were lively and graceful, though by no means as quick as those of a Squirrel. Presently he came to one of the worm-eaten branches, which he began to examine most attentively; and bending forward his ears and applying his nose close to the bark, he rapidly tapped the surface with the curious second digit, as a Woodpecker taps a tree, though with much less noise, from time to time inserting the end of the slender finger into the worm-holes as a surgeon would a probe. At length he came to a part of the branch which evidently gave out an interesting sound, for he began to tear it with his strong teeth. He rapidly stripped off the bark, cut into the wood, and exposed the nest of a grub, which he daintily picked out of its bed with the slender tapping finger, and conveyed the luscious morsel to his mouth. I watched these proceedings with intense interest, and was much struck with the marvellous adaptation of the creature to its habits, shown by his acute hearing, which enables him aptly to distinguish the different tones emitted from the wood by this gentle tapping, his evidently acute sense of smell aiding him in his search; his secure footsteps on the slender branches to which he firmly clings by his Quadrumanous members; his strong Rodent teeth enabling him to tear through the wood; and, lastly, by the curious slender finger, unlike that of any other animal, and which he used alternately as a pleximeter, a probe, and a scoop. But I was yet to learn another peculiarity. I gave him water to drink in a saucer, on which he stretched out a hand, dipped a finger into it, and drew it obliquely through his open mouth; and this he repeated so rapidly that the water seemed to flow into his mouth. After a while he lapped like a Cat; but his first mode of drinking appeared to me to be his way of reaching water in the deep clefts of trees. I am told that the Aye-Aye is an object of veneration at Madagascar, and that if any native touches one he is sure to die within the year; hence the difficulty of obtaining a specimen. I overcame this difficulty by a reward of ten pounds."

Further information on the same subject was obtained by M. Vinson, who states that his Aye-Aye slept the greater part of the day, and moved about and made attempts to escape at night time. Having once succeeded, it climbed to the nearest tree, and moved about, leaping from branch to branch with the agility of the Ring-tailed Lemur; but its ordinary life in captivity suggested the idea of its being an indolent and rather slow-moving animal. The tail is carried in a curve, with the hollow of the bend downwards, so that it is slightly arched, and its chief office seems to be to add to the warmth of the already warm fur when the animal is in repose. In assuming the attitude of rest, the Aye-Aye places its head between its hands, and bends the tail over it by curving it forwards and letting it fall. Then it rolls itself into a ball, and covers the whole surface with the bushy hairs of this useful appendage, which is longer than the whole body and head together.

With regard to the Aye-Aye mentioned by Dr. Sandwith, Owen advised that, if it could not be sent safely to England, it had better be killed by chloroform, and sent over in spirit. Before this advice arrived the animal managed to escape from its confinement, and made for the sugar-canes in a neighbouring plantation, and there the unlucky Aye-Aye was speedily captured. He was martyred for the sake of science, and its description by Owen will last as long as literature, and its skin and bones as long as the British Museum exists. Some other observers had interested themselves about the animal in the interval, and in 1855 M. Lienard is said by Owen to have observed the habits of a young male. This one liked mango nuts, and invariably made a hole in the rind with his strong front teeth, inserted therein his slender middle digit, and then lowering his mouth to the hole, put into it the pulp which the finger had scooped out of the fruit. When one hand was tired it used the other, and often changed them. On presenting him with a piece of sugar-cane, he held it by both hands, and tearing it open with his teeth, sucked out the juice. M. Vinson had one for two months, which was brought from Madagascar to the Ile de la Réunion, and he stated that it selected the grubs it liked best by the sense of smell, and that when *café au lait* or *eau marée* was offered, it drank by passing its long slender finger from the vessel to the mouth with incredible rapidity.

The Aye-Aye, according to the discovery of M. Soumagne, honorary consul of France in Madagascar, constructs true nests in trees, which resemble enormous ball-shaped "birds'-nests." He found them in the belt of forest which is situated half-way up a great mountain close to the town of Tamatave. They are composed of the rolled-up leaves of the so-called "Traveller's Tree," and are lined with small twigs and dry leaves. The opening of the nest is narrow, and is placed on one side.

and it is lodged in the fork of the branches of a large tree. In this the Aye-Aye resembles the lower Lemuroids, and not the genera *Loris* and *Tarsius*.

The specimen of the Aye-Aye examined by Owen is three feet in length, the included tail measuring one foot eight inches and a half, and the fourth fingers of the hand and the fourth toes are the longest. The forefinger is shorter than the fifth, or little finger, and the second toe, counting the toe-thumb as the first, is shorter than the little toe.

The Aye-Aye is admirably adapted for its peculiar life, although part of its construction is very unlike that of the other Lemuroids, whose habits are much the same. Having nocturnal habits, the eyes are especially formed for the purpose of admitting all the light possible. They are large, prominent, and none of the "white" or conjunctiva is seen, only the cornea and the light brown or hazel-coloured iris behind it (commonly called the "sight") being visible. It is a very staring, open eye, and the pupil is capable of being widely opened in the dark, and in fact it dilates generally as the light wanes, so as to admit every possible ray. In daylight, on the contrary, it contracts to a pin's point in size, so as to shut out the light which would dazzle the eye and probably produce injury to it. There is a tapetum (see page 214) which assists in nocturnal vision. Nature has protected the eye not only with lids, for there are traces of eyelashes on the upper one but not on the lower, under which, however, there are some bristles. There is a kind of eyebrow in the form of tufts of a dozen very slender bristle-like hairs, and to complete the arrangement for protecting the eye against direct injury, and for letting the animal know when things are near enough to injure its organ of sight, there is what is called a nictitating fold in each eye. This is a layer of the white of the eye, or conjunctiva, situated close to the inner side near the nose, and which extends when required over the "sight" as a cover and protection. In addition to the nocturnal sight, the Aye-Aye has evidently extremely delicate hearing, the ears being large, spoon-shaped, and open, and their sense is very acute. For, either by hearing or by their very fine sense of smell, it detects grubs in the wood, and soon has them out, thanks to its teeth and claws.

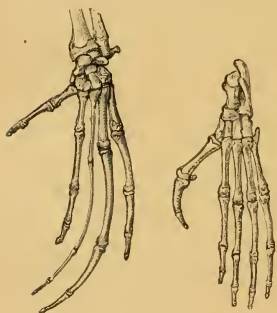
The feet are long, and are made for grasping and for supporting the Aye-Aye on boughs whilst it uses its hands and teeth. They are very strong, and have a very long ankle, and claws to all the toes, except to the great thumb-like toe, which is very powerful, and has a flat nail. But it is in the hands and teeth that the singularity of the animal is made manifest, which makes it so little like the Lemuroida as a group. The hand is unique, but the front of the skull and the front teeth resemble those of the gnawing animals, and hence the name Cheiromys, which means hand-rat. Something has been said already regarding the food of the animal, and as its nature has to do with the hands and teeth, it is advisable to quote the able Superintendent of the Zoological Gardens, Mr. Bartlett:—

"In feeding," writes Mr. Bartlett, "the left hand only is used, but the examination of the mode of taking her food requires careful attention, owing to the very rapid movement of the hand. The fourth finger, which is the largest and longest, is thrust forward into the food; the slender third finger is raised upwards and backwards above the rest, while the first finger (or thumb) is lowered so as to be seen below and behind the chin. In this position the hand is drawn backwards and forwards rapidly, the inner side of the fourth finger passing between the lips, the head of the animal being held sideways, thus depositing the food in the mouth at each movement. The tongue, jaws, and lips are kept in full motion all the time. Sometimes the animal will advance towards the dish and lap like a Cat, but this is unusual. The skeleton-like third finger is used with great address in cleansing her face and picking the corners of the eyes, nose, mouth, ears, and other parts of the body, and during these operations the other fingers are closed." From all that has hitherto been observed, the Aye-Aye evidently eats both insects and vegetable food, so that in captivity it will reject meat food more or less. In its natural state it will prefer the grubs of some trees to those which frequent others, and it searches along the boughs for some evidence of their presence, and, with teeth and slim fingers, opens their galleries and brings them to light.

The teeth are certainly remarkable. There are two sets, the milk teeth and the adult teeth. In the first, or milk teeth, there are two front teeth, one canine tooth, and a molar or grinder on each side of the upper jaw. In the lower jaw there is but one front tooth, no canine, and one molar on each side. A further peculiarity consists in the falling out of the molars, one incisor, and the canine in the upper jaw, to be replaced by the following adult dentition, or second set. This

consists of one incisor, no canine, one pre-molar, and three molars on both sides of the upper jaw; while below, the canine and pre-molar are entirely absent, the incisor and molar being like those of the upper jaw; it has thus eighteen teeth altogether. There are two front teeth in the upper and two in the lower jaw only, but they are very large, long, and narrow, being shaped like those of a Rabbit or Rat. Their tips wear away and expose a sharp cutting surface of thick enamel in front, and they are splendid cutting chisels. They gnaw and cut away wood, strip off bark, and make deep holes in the branches, and their length permits them to be placed in hollows in the wood so as to prise them open by acting as levers. It appears that they are made to grow from their sockets as they are worn down by frequent use. They are by themselves, and there is a great gap (diastema) or distance in the gums between them and the next teeth. This is quite after the fashion of the gnawing animals. The back teeth crush and champ fruit, vegetable substances, and insects with ease. There is a curious point about the chin, for there is no bony union there between the two sides of the lower jaw; on the contrary, the union is by a more or less elastic tissue, which permits of some movement up and down and from side to side during the action of the great front teeth.*

The hand is most peculiar, for certain of the fingers are so thin and long that they appear as if improperly nourished. They have the usual number of joints, and the last joints have strong curved claws. They have not the same relation of length and size as in any of the other Lemuroids, for the fourth finger is the longest instead of the third, and the third finger is so much more slim than the others, that Owen remarks that it seems as if it were paralysed. The hair is carried down the arms to the fingers, and adds to their spidery look. In the wrist there are the usual nine bones, the intermedium being there in addition to the eight recognisable in the higher Apes; and the two bones of the fore-arm greatly resemble those of the Monkeys in general.



BONES OF THE HAND AND FOOT OF AYE-AYE. (*After Owen.*)

The wrist and fore-arms are very movable, and the fingers also; but the thumbs, small as they are, and clawed, have but little of the thumb-like motion, and are but very slightly opposable to the forefinger, which, moreover, is rather shorter than the "little" or fifth finger.

On the whole the Aye-Aye presents some resemblance to the Lemuroids, and less to any other animal. Its large open ears, the eyes looking straight forward, the nostrils placed at the end of the snout, the want of any groove on the upper lip, the nature of the fur, so furry below and hairy above on the skin, are interesting to those who care to compare this animal with the Lemuroids and Rodents, or gnawing animals; so are the perfect condition of the orbits, or eye cavities, in front and their opening through behind, and the arrangement of the back-bones and limbs to those who would compare it with the Monkeys.

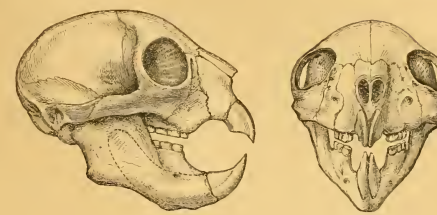
The skeleton resembles that of these last, and there are so many points of difference from the Rodents—although the skull at first sight looks like that of a Rat—that this very exceptional creature is classified with the Lemuroida from its partial resemblance to them and the Monkeys.

THE CLASSIFICATION OF THE LEMUROIDA.

Now that the Madagascar, African, and Asiatic Lemuroids have been noticed, and their prominent peculiarities described, it is easy to arrange them in the proper classification. Firstly, the

* The formula of the milk set is—I. $\frac{4}{4}$, C. $\frac{2}{0}$, M. $\frac{2}{2}$, = 12. That of the permanent set is—I. $\frac{2}{2}$, C. $\frac{0}{0}$, P. M. $\frac{3}{0}$, M. $\frac{6}{6}$ = 18. Professor Peters of Berlin moreover states his having found in a very early stage of development in the Aye-Aye, rudimentary teeth yielding a milk dentition—I. $\frac{2}{2}$, C. $\frac{1}{0}$, M. $\frac{2}{2}$ = 18.

position of the whole sub-order is next to the Hapale Monkeys of South America in the order of Primates. Then, if the figures or stuffed specimens of an Aye-Aye, a Tarsius, and a Slow Loris be compared, there is no difficulty in distinguishing them, for they differ much. But if a Lepilemur and a Galago are compared, it will be noticed that although they differ enough to be placed in two genera, still the distinction is not great. So it is advisable to group them together in a family; but the three others must belong each to a separate family. The scheme of Professor Mivart, who has paid much attention to these animals, and which we adopt, is as follows:—



SKULL OF THE AYE-AYE (SIDE AND FRONT VIEW). (*After Owen.*)

FAMILIES OF THE SUB-ORDER LEMUROIDA AND THEIR GENERA.*

	Genera.
Family I.—Lemuridæ	Indris. Lepilemur. Lemur. Hapalemur. Cheirogale. Galago.
Family II.—Nycticebidæ	Perodicticus. Loris, or Stenops. Nycticebus. Arctocebus.
,, III.—Tarsidæ	Tarsius.
,, IV.—Cheiromydæ	Cheiromys.

As groups these have more or less well-defined differences. Thus, the Lemuridæ have no *rete mirabile*, and, except in one species, the tail is large, and all have their hind legs longer than their front ones.

The Nycticebidæ have short ears and faces, and the tail is short or absent. They have a strange defect in the fingers (of hand and foot), the ankle is short, and there is a *rete mirabile*.

As a family the Tarsidæ have long ears, a long ankle, a long and slender tail, and there is a *rete mirabile*. Moreover, the fourth finger is not the longest.

The Cheiromydæ are known at once by their great front teeth, and the probe-like middle finger of the hand.

GEOGRAPHICAL DISTRIBUTION.

All the kinds of Indris, Lepilemur, Hapalemur, Lemur, and Cheirogale inhabit Madagascar and some of the small islands close to its coast, and one kind of Lemur is found in one if not in two of the Comoro Islands, which are between the north-west of Madagascar and the African coast, and nearer the island than to the continent. They have not been discovered elsewhere, and this is extremely interesting, because, with the exception of the genus Galago, they form the entire family of the Lemuridæ. The Galagos are not found in Madagascar, but in the woods and forests of the opposite

* The simplicity of this classification is its great merit. The student will, however, find many other genera mentioned in books or placed before the specific names in museums. Thus, the beautiful Lemuroids in the British Museum of our genus Indris are called Propithecus, when the animals have tails, and the genus Lemur is termed *Varecia*. The genus Galago includes the animals called by some zoologists *Otolicnus* and *Otogale*, &c.

coast of Africa. Some Galagos are found as far south as Port Natal, and the thick-tailed species inhabits both the eastern and the western coasts of the continent, and the central parts also. Others have been found near the Gaboon and in Fernando Po, Senegal, and Gambia, and in the country of Sennaar and near the White Nile. The Aye-Aye is essentially a Madagascar form. The Nycticebidan family has a wide geographical range. Thus, the species of the genus Loris are found in Ceylon, in Southern India at Pondicherry, and in Hindostan; the genus Nycticebus has one species in Borneo and Sumatra, a second in Java, and a third in China. On the contrary, the remaining genera, Perodicticus and Arctocebus, are limited to the west coast of Africa, none of them being found in the intermediate regions of that continent or in Madagascar. Finally, the Tarsidæ, according to Wallace, inhabit Borneo, Celebes, and some other neighbouring islands, the species being the same in all localities. How is the widespread distribution of the animals of the sub-order to be explained? On the presumption that they all sprang from one parent stock, it is necessary to suggest the occurrence of vast geographical changes in bygone ages, such, for instance, as the former connection of Madagascar and the mainland of Africa, and their separation; the former existence and subsequent subsidence of a vast tract of land between Hindostan and Africa, north of and remote from Madagascar; and the former continuity of land where there are now the islands of Borneo, Sumatra, and Java. It is necessary also to assume that Ceylon was united to Hindostan; and the great islands just mentioned to the continent of Asia. The land which was intermediate between Hindostan and Africa has been called Lemuria by Dr. Sclater, and its theoretical existence explains the otherwise incomprehensible presence of Giraffes and Hippopotami, now purely African genera, in the olden time in Asia. Geology rather favours these views. The first Lemuroida swarmed amongst the forests of these vast countries, and their descendants cut off from each other by geographical changes are now limited to very remote localities.

The fossil remains of Lemuroida, or of animals whose skulls resemble somewhat those of the sub-order, have been found in the Eocene of the Western territories, of the United States, and also in the south of France.

The particular muscles of the hand, arm, and shoulder which characterise the Monkeys, and which have been described in the former chapters, are found in the Lemuroids; and Murie and Mivart have already shown that in the Lemuroids the muscles agree mainly with those of Monkeys, and others bear certain resemblances to those of animals lower in the scale. Moreover, the Lemurs possess a unique band of fleshy fibres, which stretch between the shin-bone and the adjoining small bone of the leg, which would seem to serve in aiding the turning of the limb (the rotator fibulæ).

JAMES MURIE.
P. MARTIN DUNCAN.

MARSH BAT. (*One-half natural size.*)

CHIROPTERA, OR WING-HANDED ANIMALS.

THE BATS.

CHAPTER I.

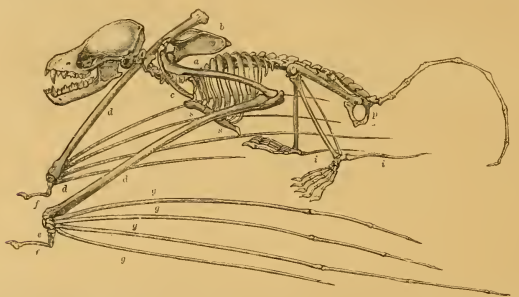
INTRODUCTION.—CLASSIFICATION OF BATS.—THE FRUIT-EATING BATS.

One of Æsop's Fables—Opinions of the Ancients regarding Bats—Scaliger's Statement of the Puzzle—Opinions of the Middle Ages—The True Position of the Bats—The Wing of the Bat—General Structure: The Breast-bone, Arms, Fingers, "Wing-membrane," Wings, Skull, Ribs, Pelvis, Legs—In Repose—Walking—The Teats—Organs of the Senses—"Blind as a Bat"—The Eyes—Spallanzani's Experiments—The Bat's Power of Directing its Flight in the Darkest Places—Their Food—In Winter-Quarters—A Battue of Bats—FRUGIVOROUS AND INSECTIVOROUS BATS.

ONE of those ancient fables ascribed to Æsop, which were the delight of our younger days, contains a description of a battle between the birds and the beasts. The grounds of the quarrel we do not remember, and indeed the moral of the fable was tacked on to the conduct of the Bat. Availing himself of his combination of fur and wings, that astute animal hovered over the field of battle, and took his place on one side or the other, according to the direction in which the tide of success appeared to be turning, with the purpose, of course, of claiming in any case to be on the side of the victors. But this finesse was unsuccessful; the traitor was scouted by both parties, and has ever since been compelled to make his appearance in public only at night. Passing over the ingenious explanation thus afforded of the nocturnal habits of the Bats, this fable reflects pretty clearly the state of uncertainty in which the ancients were as to their precise nature. The union of a Mouse-like body with long wings was a great puzzle to people who had no sound principles of natural history classification to go upon; and even among the naturalists of antiquity there was much doubt as to the true position to be assigned to animals so singularly endowed. Aristotle seems to have thought they were birds with wings of skin; and Pliny describes them as the only birds which bring forth their young alive and suckle them. Among the Jews it is perfectly clear that the Bat was reckoned a bird; it is distinctly included among the unclean fowls in Leviticus (xi. 19), and Deuteronomy (xiv. 18). The obfuscation displayed by ancient writers with respect to the Bat is well shown in the following passage, in which Scaliger summarises their opinions:—"It is indeed," he says, "an animal of marvellous

structure; biped, quadruped; walking, but not with feet; flying, but not with feathers; seeing without light, in the light, blind; it uses light beyond the light, but wants light in the light; a bird with teeth, without a beak, with teats, with milk, bearing its young even when flying." Can it be wondered at that such a creature should be a puzzle?

Nevertheless, some ancient writers seem to have entertained clearer notions on the subject, such as Macrobius, who maintained that as the Bat walked like a quadruped it ought to be classed with quadrupeds, for which he is blamed by Jonston, who speaks with approval of Plato's opinion, according to which this unfortunate animal is neither bird nor beast, an opinion which partially prevailed to a rather late date. Throughout the Middle Ages, however, the general opinion even of professed naturalists was that Bats were birds; and we find this notion prevailing down to the time of Aldrovandus, in the latter part of the sixteenth century, and of Jonston, whose gigantic compilation was published in 1657. It is a question whether this notion that Bats are birds has even yet been entirely dispelled in the popular mind, and no doubt many people still regard them as birds, because they



SKELETON OF THE MOUSE-COLOURED BAT (VESPERTILIO MURINUS.) (*From De Blainville*)

a, humerus; *b*, shoulder-blade; *c*, collar-bone; *d*, fore-arm (radius, with the ulna at the elbow); *e*, wrist-bones (carpal-bones); *f*, thumb; *g g*, metacarpal bones; *s s*, breast-bone (sternum); *p*, pelvis; *t t*, heel-spur.

can fly, just as Whales and Seals are considered fishes, because they swim, and Centipedes and Scorpions reptiles, because they crawl. John Ray, the father of modern zoology, writing in 1683, was the first to refer the Bats to their true position among the Mammalia (animals which suckle their young), and in this course he was followed by Linnæus, who actually placed these puzzles of former naturalists in his highest order of Mammals, the Primates, along with man and the Apes. The position assigned to them by Linnæus in the series of animals they have virtually retained in nearly all systems to the present day.

By all modern zoologists the Chiroptera have been regarded as a distinct order of the Mammalia, characterised especially by their possession of the power of flight, and the consequent modification of the structure of their fore limbs, which is indicated in the name given to the group (Chiroptera—hand-wings). They are, in fact, the only true flying Mammals, and, indeed, the only truly flying Vertebrates except birds, for the so-called flying Squirrels, flying Lemurs, and flying Opossums are only furnished with a broad fold of skin on each side of the body, which, when expanded by the spreading of the limbs, acts as a sort of parachute to sustain them for a time in the air. This is also the case with the flying Dragons, although in them the membrane is stiffened by means of a portion of the ribs; and even in the flying fishes, in which the organs of aerial locomotion are formed by the fore-limbs, these merely sustain the fish in the air for a time by the increased surface they give it, but do not serve as real wings, like those of Bats and birds.

There is, however, an important difference in the structure of the wing in the Bats and birds

although the general principle on which the organs of flight are constructed is the same. In both (as indeed also in flying insects), this principle consists in having a strong framework, to which an up and down movement can be communicated, along the front of the wing, enabling it to strike the air with more or less force during its downward passage, whilst the effective surface of the organ is of a flexible or elastic nature, being formed in the bird by the long feathers which are implanted in the skin clothing the bones of the wing, and in the Bat by a thin leathery membrane which is stretched between the bones of the fore and hind limbs. Upon these leathern wings the Bats flit about noiselessly in the twilight or in the darkness of the night. They are able to advance with considerable speed, and also to turn and wheel about in their course with great facility.

Of course, as in birds, the principal modification of structure exhibited in these animals is connected with their power of flight, and manifested in the fore-limbs. These, although most disproportionately developed, still, however, display the same bones which have been described in the arms of the Monkeys and Lemurs, as will be seen in our figure of the skeleton of the European Mouse-coloured Bat. We find in them a strong humerus (*a*) of moderate length, articulating with large shoulder-blades (*b*), which cover a considerable portion of the back of the chest, and are kept apart by well-developed collar-bones (*c*), springing in front from a breast-bone (sternum, *s*), which, although distinctly showing Mammalian characters, projects in such a manner as to serve the purpose of the deep keel in the breast-bone of birds, and give attachment to the powerful muscles required to set the wings in motion (see accompanying figure). The humerus is followed by the bones of the fore-arm (*d*), the radius and ulna, of which, however, the latter is generally very small, and reduced to a mere rudiment immovably fixed to the radius towards the end nearest the body. This section is the longest part of the arm, and the simplicity of its structure is in connection with the fact that, as in birds, there is here no occasion for any movement of rotation in the arm, such as enables the fore-limbs of many Mammals to be applied to a variety of uses. At the extremity of the radius are the carpal or wrist-bones (*e*), which are small but numerous, and furnish surfaces for the articulation of the bones of the fingers. Of these, the first, or thumb (*f*), is short, and composed of three joints, a metacarpal and two phalanges, the last of which bears a strong curved claw, of great use to the animal in clinging to various surfaces, and in walking on the ground. Of the other four fingers, the metacarpal bones (*g*) are very long and slender, forming, indeed, the greater part of the fingers; they taper towards their tips, but at the tips themselves are slightly enlarged. The first, or index finger, in most Bats is composed of the metacarpal bone alone, but in some this is followed by two short phalanges. The other fingers possess either two or three phalanges. In general only the thumb possesses a claw, but in some Bats there is one also on the index finger.

THE STERNUM OF FLYING FOX (PTEROPUS).

To convert this framework into an organ of flight its various parts are, as already stated, united by a membrane of more or less leathery appearance, although often so thin and delicate as to be somewhat translucent. It is an expansion or wide fold of the skin of the body like those forming the parachutes of the flying Squirrels, &c., and often called by the same name—*patagium*. We shall employ the simpler, if rather longer term, "wing-membrane." The bones of the arm, with their accompanying muscles, and those of the fingers, are enclosed between the two layers of skin of which the membrane is composed, and which they serve to extend and support. In front of the arm there is a small portion of membrane filling up the angle of the elbow, and called the antebrachial membrane. The thumb is left free. Behind the arm is the great expanse of the wing, which springs from the sides of the body, and is also attached to the hind legs, generally extending down to the ankle.

The wings are expanded by the spreading of the fingers, which radiate from the wrist something like the sticks of a fan. The second, or middle finger, which is the longest, runs to the extreme tip of the wing, but before reaching this it generally joins the extremity of the first, or index finger, which thus acts as a sort of stay to it, and the two fingers together form a tolerably stiff support for the outer margin of the wing. The other two fingers (the third and fourth) traverse the wing to its hinder border, where they carry out the membrane into small pointed projections; so that when the

wing is expanded, this border shows two points besides that at the apex of the wing, and three more or less rounded notches, the last of which is between the tip of the fourth finger and the attachment of the membrane to the hinder limb.

In most Bats the membrane does not stop short at the legs, but encloses them after the same fashion as the arms, leaving only the foot and sometimes a part of the shank free. The portion of membrane that passes within the legs, sometimes filling up the whole space between them and enclosing the whole or a part of the tail, sometimes forming only a narrow border to these limbs, is called the interfemoral or intercrural membrane, and the characters furnished by it and its relations to other parts are of great importance in the classification of Bats.

The rest of the structure of these animals may be dismissed in a few words. The skull, and all the other parts of the skeleton, are generally light and delicate in their construction, as might be expected in animals destined to support themselves in the air; but there is no trace of those pneumatic cavities which, in birds, enable the air to penetrate all parts of the skeleton. The jaws are well armed with teeth, which differ in their character in accordance with the food consumed by the animals. The ribs are well developed, and enclose a large chest cavity. The pelvis (*p*) is long, slender, and somewhat bird-like in some respects; the legs are short, generally slender, and articulated in such a manner that when used in walking the knees are directed backwards, like our elbows; the fibula (the second bone in the shank) is usually imperfectly developed, in the same way as the ulna in the fore-arm; and the foot consists of five distinct toes, armed with small but sharp claws, by which the animals suspend themselves from the surface of rocks, walls, and other objects, in the dark retreats to which they retire for their repose. From the heel-bone (*calcaneum*) in most Bats there springs a cartilaginous or bony rod or spur, which is regarded by some zoologists as forming part of the bone itself. This spur, which is often of considerable length, runs along the margin of the interfemoral membrane, which it no doubt helps materially to stretch. When long, and more or less curved, it often causes a projection of the side of the interfemoral membrane, as shown in the figure of the Marsh Bat (p. 259). The tail is very variable in length.

In repose, or rather when not flying, the wings of the Bat are folded up by a reversal of the process by which they were extended for flight; the long fingers are drawn together, and up towards the fore-arm, and the membrane forms leathery folds at the sides of the body. This is also their position when the animal is walking or running on the ground (see the engraving on the next page), which it does in a somewhat awkward fashion, by the action of its hind feet and the claws of its thumbs. When seen thus engaged there can be little doubt as to the quadruped nature of the Bat. Our little European species have a Mouse-like appearance, which fully justifies their old popular name.

The teats are usually situated on the breast; but sometimes they are placed quite on the sides, immediately beneath what we must call the armpits. They are two in number. In addition to these chest or pectoral teats, some species have been described as possessing a second pair of such organs situated on the groin, but recent investigations prove clearly that these are merely nipple-like warts.

The organs of the senses are well developed. The ears are almost always of considerable size, sometimes very large and membranous, and in most cases there is in front of the cavity a sort of lobe of variable form, called the earlet, or tragus, representing the little rounded lobe which, in the human ear, projects from behind the cheek over the opening (see the woodcut of the Head of the Long-eared Bat). The nostrils are either simple slits or apertures at the end of the muzzle, or surrounded by leaf-like organs, often of the most extraordinary forms (see the Head of the Spectacled Vampire, p. 264, and other illustrations later on), in fact, this tendency of the skin in Bats to run out into membranous expansions is one of their most remarkable characteristics, and, from their mode of life, this great development of the skin system would seem to be almost essential to their existence.

The old proverbial expression, "As blind as a Bat," is certainly not founded on a due appreciation of facts, for Bats are by no means blind; on the contrary, they are furnished with very efficient eyes, although, in most cases, these are little bead-like organs, very unlike the eyes usually seen in animals whose activity is nocturnal or crepuscular. But it would appear that the office of the eyes in guiding these animals is, at all events, supplemented by some other means. Towards the end of the last century, the Abbé Spallanzani made some exceedingly interesting, although certainly cruel experiments on various species of Bats. He blinded these animals, sometimes by burning the eyes with a red-hot

wire, sometimes by removing the organs altogether, and even filling up the orbits with wax, and then allowed them to fly. In spite of the mutilation, the unfortunate little creatures continued quite lively, and flew about as well as those which still retained their eyes; they did not strike against the walls of the room, or the objects in it, avoided a stick held up before them, and showed a greater desire to keep out of the way of a Cat or the hand of a man than to escape contact with inanimate objects. One of these blinded Bats was set free in a long underground passage, which turned at right angles about its middle. It flew through the two branches of this passage, and turned, without approaching

BARBASTELLE WALKING.

the side walls. During its flight it detected a small cavity in the roof at a distance of eighteen inches, and immediately changed its course in order to conceal itself in this retreat. In a garden a sort of cage was prepared, with nets, and from its top sixteen strings were allowed to hang down. Two Bats were introduced into this enclosure, one blinded, the other with its eyes perfect. Both flew about freely, never touching the strings with more than the tips of the wings. Finally, the blind Bat discovered that the meshes of the enclosing net were large enough for it to get through, and made its escape; and, after flying about for a time, made its way rapidly and directly to the only roof in the neighbourhood, in which it disappeared. In a room containing numerous branches of trees, or in which silk threads, stretched by small weights, were suspended from the ceiling, the Bats, though blinded, avoided all these obstacles; and when, after tiring themselves with their aerial evolutions, they settled on some object for the sake of rest, they would immediately rise again on an attempt being made to seize them with the hand.

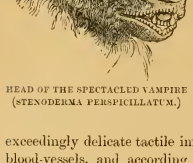
HEAD OF LONG-EARED BAT.

From these experiments it was perfectly clear that in threading the galleries of caverns and other narrow and pitch-dark places to which Bats commonly resort for their diurnal repose, these animals were guided by some other sense than that of sight, and the worthy abbé set himself to ascertain what this sense might be. He commenced operations by covering the body of one of his blind Bats with varnish, and found that this had no effect in rendering its movements uncertain. He then stopped up the ears with wax, and finally with melted sealing-wax, and still the Bats obstinately persisted in avoiding obstacles placed in their way. Consequently they did not *hear* their way in the dark. There remained the senses of smell and taste. To test the former the nostrils were stuffed up, but the only effect of this operation was to bring the creature speedily to the ground, owing to difficulty of

breathing. Little fragments of sponge impregnated with musk, camphor, or storax were fastened in front of the nostrils, and then the Bats flew about as freely as ever, and showed the same power of avoiding contact with objects in their path. The removal of the tongue, as might be expected, produced no result.

Many of Spallanzani's experiments were repeated by M. de Jurine, of Geneva, and with similar results, although Jurine found that when the ears were effectually stopped the Bats struck their wings against any object that came in their way.

Spallanzani found further that when the head of a Bat was enclosed in a small paper bag, or even wrapped in some fine light stuff, the animal could not be induced to fly. Coupling this observation with the results of his other experiments, he came to the conclusion that the mysterious faculty possessed by Bats of finding their way in the darkest places was due to some special sense with which they were endowed, and which was seated in some unknown organ situated in the head. Cuvier, however, who was the first really to appreciate the results of these experiments, arrived at the conclusion, now generally accepted, that the wonderful power possessed by Bats of directing their flight in places so dark as to render the sharpest eyes useless, was due to an exceptional development of the sense of touch, residing especially in the great delicate membranous expanse of the wings. These organs are really of the most delicate structure, and traversed by nerves, the fine ramifications of which terminate in little loops, like those found in those parts of the skin in man in which the sense of touch is manifested with the greatest perfection; and their surface is covered with rows of small thickened points, or papillæ, which may very probably have something to do with the perception of exceedingly delicate tactile impressions. Further, the wings of Bats are very copiously supplied with blood-vessels, and according to Dr. Wharton Jones even the veins are furnished with contractile walls, so that the circulation of the blood in them must be exceedingly active. In fact, according to Professor St. George Mivart, we have here a condition of things which may be in some degree analogous to a state of inflammation, which would doubtless considerably heighten the sensibility of the parts. But besides the wing-membranes many Bats, as we have seen, possess greatly enlarged ears, and also curious leaf-like and membranous appendages attached to the region of the nose, all of which no doubt partake of the sensibility of the wing-membranes, and assist in no small degree in guiding their possessors. In fact, from some observations recorded in Bell's "British Quadrupeds" with regard to two British species (the Pipistrelle and the Horseshoe Bat), it would appear that the species with nasal appendages show greater acuteness of perception than those with simple noses, and many of them are known to frequent the darkest places of retreat, and to fly later than some of their less highly endowed fellows.



HEAD OF THE SPECTACLED VAMPIRE (STENODERMA PERSPICILLATUM.)

The food of the great majority of Bats consists of insects, which they capture on the wing. The members of one large family, however, and some species of another, feed upon fruits; whilst a few find at least a part of their nourishment in the blood of other animals. They generally fly in the twilight of the evening and morning, retiring to obscure places during the day, although some species will occasionally come out of their concealment by daylight.

In temperate and cold climates they pass the winter in a torpid state suspended by their hinder claws in their ordinary places of daily retreat, where they are often to be found in immense numbers. An American gentleman, describing a cave in the Western Territories, where the excrements of Bats had formed so large a deposit of "guano" that it was proposed to utilise it as manure, was asked by a friend of ours about the number of Bats in the cavern. He said, "Well, I guess when we went in there was about as much Bats as air in it." There is doubtless a slight tinge of occidental hyperbole about this statement, but the following sober details, although also from the Western continent, may serve to show what multitudes of these creatures may collect together when left undisturbed in a suitable haunt. The story is told in the introduction to Dr. Allen's "Monograph of the Bats of North America," and is a description by M. Figaniere, Portuguese Minister to the United States, of the incidents attending his occupation of a new house in May, 1860:—

"The weather," he says, "which was beautiful, balmy, and warm, invited us towards evening to out-door enjoyment and rest, after a fatiguing day of travel and active labour; but chairs, settees, and benches were scarcely occupied by us on the piazza and lawn, when to our amazement, and the horror of the female portion of our party, small black Bats made their appearance in immense numbers, flickering around the premises, rushing in and out of doors and through open windows, almost obscuring the early twilight, and causing a general stampede of the ladies, who fled, covering their heads with their hands, fearing that the dreaded little vampires might make a lodgment in their hair.

"This remarkable exhibition much increased our disappointment in regard to the habitable condition of our acquisition, and was entirely unexpected, inasmuch as the unwelcome neighbours were in their dormant state, and ensconced out of sight when the property was examined previous to purchase.

"Evening after evening did we patiently, though not complacently, watch this periodical exodus of dusky wings into light from their lurking-places one after another, and in some instances in couples, and even triples, according as the size of the holes or apertures from which they emerged in the slate roofing would permit. Their excursions invariably commenced with the cry of the *Whippoorwill*, both at coming evening and early dawn, and it was observed that they always first directed their flight towards the river, undoubtedly to damp their Mouse-like snouts, but not their spirits, for it was likewise observed that they returned to play hide and seek, and indulge in all other imaginable gambols: when, after gratifying their love of sport, and satisfying their voracious appetites (as the absence of Mosquitoes and Gnats testified), they would re-enter their habitation, and again emerge at the first signal of their feathered trumpeter. Thus I ascertained one very important fact, namely, that the Bats, or the species which annoyed us, ate and drank twice in twenty-four hours. Such appeared their habit, such, therefore, was their indispensable need." After trying various remedies, none of which seemed to abate the nuisance, M. Figaniere adopted the following plan:—

"When the Bats' *réveillé* was sounded by the bugle of the *Whippoorwill*, all the hands of our establishment, men and boys, each armed with a wooden implement (shaped like a cricket-bat), marched to the third floor, 'on murderous deeds with thoughts intent.' A lighted lantern was placed in the middle of one of the rooms, divested of all furniture, to allure the hidden foe from their strongholds. After closing the window to prevent all escape into the open air, the assailants distributed at regular distances to avoid clubbing each other, awaited the appearance of the Bats enticed into the room by the artificial light and impelled by their own natural craving. The slaughter commenced, and progressed with sanguinary vigour for several hours, or until brought to a close by the weariness of dealing blows that made the enemy bite the dust, and overpowered by the heat and closeness of the apartment. This plan succeeded perfectly. After a few evenings of similar exercise, in which the *batters* became quite expert in the use of their weapons, every wielding of the wooden bat bringing down an expiring namesake, the war terminated by the extermination of every individual of the enemy in the main building. However, there still was the cockloft of the laundry, which gave evidence of a large population. In this case I had recourse to a plan which had been recommended, but was not carried out in regard to the dwelling-house. I employed a slater to remove a portion of the slating which required repairing. This process discovered some fifteen hundred or two thousand Bats, of which the larger number were killed, and the remainder sought the barn, trees, and other places of concealment in the neighbourhood.

"To remove the very disagreeable odour which remained in the upper part of the house, various kinds of disinfectants were employed with some advantage; but the most effectual method resorted to was that of opening holes of about four inches square, two at each gable end, to permit a current of air to pass through. These holes were covered with wire gauze to prevent the re-entrance of any of the remainder of the army of the enemy which might hover around the premises. At the end of five years the odour has now nearly disappeared, being hardly perceptible during a continuance of very damp weather."

The great number of species of Bats which have been described from various parts of the world, but especially from tropical and sub-tropical regions, display two very strongly-marked types of structure, associated in general with very different habits and modes of life. Some are exclusively confined to a

fruit diet, or consume animal food only as an exceptional dainty; whilst the others almost as exclusively find their nourishment in the swarms of insects which everywhere people the air. Of the latter, however, some few feed upon fruits, and others are said to diversify their insect fare by occasionally sucking the blood of other animals, and even of man himself. In the Frugivorous, or Fruit-eating Bats, the crowns of the molar teeth are smooth, with a central furrow running in the direction of the length of the jaw; in the Insectivorous forms, on the contrary, the molars show sharp tubercles separated by transverse furrows, generally producing a sort of W-like pattern on each tooth. These two types of tooth-structure are associated in each case with other characters. The Bats are thus divided into two great groups, generally regarded as sub-orders.

HEAD OF THE KALONG.

CHAPTER II.

SUB-ORDER I.—MEGACHIROPTERA, OR LARGE BATS.

FAMILY I.—PTEROPIDÆ, OR FRUIT-EATING BATS.

Characteristics of Fruit-Eating Bats—Distribution—Diet—Flying Fox of Ceylon: its Habits, as described by Sir E. Tennent—The Flight of the *Pteropidæ*—Known to the Ancients—The Fruit Bats in the Zoological Gardens—INDIAN FLYING FOX—Diet—Dissipated Habits—GREAT KALONG—Linnæus's Description—In their Dormitories—NICOBAR, MANED, JAPANESE, and GREY FRUIT BATS—GREY-HEADED FRUIT BAT—GOULD'S FRUIT BAT—ROUSSETTE—EGYPTIAN FRUIT BAT—HOTTENTOT FRUIT BAT—MARITIME FRUIT BAT—MARGINED FRUIT BAT—WHITE'S FRUIT BAT—HAMMER-HEADED BAT—HARPY BAT—GREATER HARPY BAT—CLOAKED FRUIT BAT—DWARF LONG-TONGUED FRUIT BAT—BLACK-CHEEKED FRUIT BAT—FIJIAN LONG-TONGUED FRUIT BAT.

THE fruit-eating Bats (*Frugivora*, Wagner), called *Megachiroptera*, or Large Bats, by Mr. Dobson, on account of the comparatively large size of most of the species, are characterised by having the face elongated and Dog-like (see above illustration)—whence the name of Flying Foxes is often applied to them by European residents in the countries where they occur—the ears simple and usually pointed, but with the sides uniting, so as to form a complete ring at the base, the nose without any leaf-like

FRUIT BATS OF CEYLON AT HOME.

appendages, the tail short or altogether deficient, the interfemoral membrane, or the membrane between the legs, which in our ordinary Bats encloses the tail, reduced to very small dimensions, and the molar teeth furnished with flattish crowns, along the middle of which runs a longitudinal furrow (figured below). The free thumb is long, and armed with a strong hooked claw, and the first, or index finger, in nearly all the species, is also terminated by a claw.

The species of Frugivorous Bats, of which about seventy have been described, agree very closely in their general characters, and constitute a single family, to which the name of *Pteropidæ* has been given, derived from that of the oldest and most extensive of its genera, *Pteropus* (wing-foot). They are distributed all over the warmer parts of the Eastern hemisphere and the islands of the Pacific. Wherever they occur, they present nearly the same form, and generally a very similar style of coloration, whilst in their diet they stick most religiously to fruits, for although some have been found in captivity to feed on the flesh of birds and rats, and others are charged with catching and eating fish, in the former case some allowance must be made for the artificial condition of the animal, which probably produced a morbid appetite, heightened by the fact that the supply of his natural food had been exhausted; and the second statement seems to rest exclusively on the observed fact of these Bats on leaving their roosts at sunset skimming close over the surface of water, and sometimes even dipping into it; but the object of these evolutions, as remarked by Mr. Dobson, "is probably, in the first instance, to drink, and, secondly, to rid themselves of some of the numerous parasites with which they are commonly infested." Sir James Emerson Tennent, however, says of the Ceylonese species, that "insects, caterpillars, birds' eggs, and young birds are devoured by them; and the Singhalese say that the Flying Fox will even attack a Tree Snake," but these statements are not confirmed by other writers, and from the reference to the Singhalese, it seems probable that they are founded upon hearsay evidence. Mr. Dobson, however, has suggested that one species (the *Cynonycteris amplexicaudata*) feeds occasionally upon the shell-fish that it finds upon the shore, and in this opinion he is supported by Mr. W. T. Blanford, who found the species upon the island of Kishm, in the Persian Gulf, a spot so barren that he thinks the Bats would starve if they depended upon fruits for their nourishment.

DENTITION OF THE ECYPTIAN FRUIT-BAT.

The habits of the Flying Fox of Ceylon (*Pteropus medius*) are so well described by Sir James Emerson Tennent, that we may here quote his observations upon that species, especially as they will apply, *mutatis mutandis*, to the members of the family in general. He says:—"They feed, amongst other things, on the guava, the plantain, the rose-apple, and the fruit of the various fig-trees. Flying Foxes are abundant in all the maritime districts, especially at the season when the *pulum-imbul* (*Eriodendron orientale*, Stead.), one of the silk-cotton trees, is putting forth its flower-buds, of which they are singularly fond. By day they suspend themselves from the highest branches, hanging by the claws of the hind-legs, with the head turned upwards, and pressing the chin against the breast. At sunset taking wing, they hover, with a murmuring sound occasioned by the beating of their broad membranous wings, around the fruit-trees, on which they feed till morning, when they resume their pensile attitude as before. [See Plate 9.]

"A favourite resort of these Bats is the lofty india-rubber trees, which on one side overhang the Botanic Gardens of Paradenia, in the vicinity of Kandy. Thither for some years past they have congregated, chiefly in the autumn, taking their departure when the figs of the *Ficus elastica* are consumed. Here they hang in such prodigious numbers, that frequently large branches give way beneath their accumulated weight. Every forenoon, between the hours of 9 and 11, they take to wing, apparently for exercise, and possibly to sun their wings and fur, and dry them after the dews of the early morning. On these occasions their numbers are quite surprising, flying in clouds as thick as

Becs or Midges. After these recreations, they hurry back to their favourite trees, chattering and screaming like Monkeys, and always wrangling and contending angrily for the most shady and comfortable places in which to hang for the rest of the day protected from the sun. The branches they resort to soon become almost divested of leaves, these being stripped off by the action of the Bats attaching and detaching themselves by means of their hooked feet. At sunset they fly off to their feeding-grounds, probably at a considerable distance, as it requires a large area to furnish sufficient food for such multitudes.

"In all its movements and attitudes, the action of the *Pteropus* is highly interesting. If placed upon the ground, it is almost helpless, none of its limbs being calculated for progressive motion; it drags itself along by means of the hook attached to each of its extended thumbs, pushing at the same time with those of its hind feet. Its natural position is exclusively pensile; it moves laterally from branch to branch with great ease, by using each foot alternately, and climbs, when necessary, by means of its claws.

"When at rest or asleep, the disposition of the limbs is most curious. At such times it suspends itself by one foot only, bringing the other close to its side, and thus it is enabled to wrap itself in the ample folds of its wings, which must envelop it like a mantle, leaving only its upturned head uncovered. Its fur is thus protected from damp and rain, and to some extent its body is sheltered from the sun.

"As it collects its food by means of its mouth, either when on the wing or when suspended within reach of it, the Flying Fox is always more or less liable to have the spoil wrested from it by its intrusive companions, before it can make good its way to some secure retreat in which to devour it unmolested. In such conflicts they bite viciously, tear each other with their hooks, and scream incessantly, till, taking to flight, the persecuted one reaches some place of safety, when he hangs by one foot, and grasping the fruit he has secured in the claws and opposable thumb of the other, he hastily reduces it to lumps, with which he stuffs his cheek-pouches till they become distended like those of a Monkey. Thus suspended in safety, he commences to chew and suck the pieces, rejecting the refuse with his tongue." Sir James Emerson Tennent adds that the Flying Fox drinks by lapping, to do which it suspends itself head downwards from a branch above the water.

The flight of the *Pteropidæ* is strong and direct, although not very rapid, and they often travel considerable distances in search of favourite articles of food. During flight the hind legs are usually stretched out horizontally, and as the space between them is not, as in most other Bats, filled up by an interfemoral membrane, the animals appear as if they had two stiff tails. Their skin exhales a peculiar odour, which has been sometimes described as "musky," although the term is hardly applicable to it. This odour, which is supposed to be due to the contamination of the fur with the urine of the animals, strongly pervades their dwelling-places, and unless great care is taken in skinning them their flesh is said to acquire a corresponding taste, which is a matter of some importance, as the larger species constitute a favourite article of food in the countries which they inhabit.

That the ancients were acquainted with some species of these Bats seems pretty certain, as one of them (*Cynonycteris ægyptiacus*) is common in Egypt, and, in fact, is frequently represented on the monuments of that country (see the engraving on the next page), and Aristotle refers to a tail-less African Bat, which was probably a Flying Fox. The town of Borsippa, in Mesopotamia, is mentioned by Strabo as being haunted by Bats of larger size than any of those known in Europe; and, indeed, that it was so haunted, and that the inhabitants ate these Bats, is nearly all that is definitely known of the town. The species was in all probability either the Egyptian one just referred to, or a nearly allied form (*Cynonycteris amplexicaudata*), which is known still to inhabit Persia. The Mosaic prohibition of the Bat as an article of food to the Jews also no doubt related to one of these species, which may have been commonly eaten in Egypt or in Syria.

Formerly it was considered a matter of considerable difficulty to keep these Frugivorous Bats alive in captivity, and especially to transport them to Europe; but the latter difficulty has disappeared with increased facilities of locomotion, and several species have been exhibited alive in various menageries and zoological gardens.

The Zoological Society's beautiful Gardens in Regent's Park, London, generally contain several examples of the Collared Fruit Bat of South Africa (*Cynonycteris collaris*). It may be noted that

these animals thrive remarkably well in their rather confined cages in the Monkey House, where, unfortunately, they have no opportunity of displaying their activity on the wing; but the visitor may see their usual attitude in repose, suspended by their hind feet, and with their wings wrapped round them like a cloak, whilst the fact of their curtain being lifted is always sufficient to disturb some of them, and induce them to turn their sharp little noses and bright eyes in the direction of the intruder, and to utter the little querulous cry which seems to indicate their objection to being disturbed. At night, however, they become more active, crawling briskly about their cage, and quarrelling vigorously among themselves for the choice morsels of their food. They also breed freely in their prison (especially the African species). The young African Fruit Bats born in the Zoological Gardens were covered with short, smooth hair of a nearly uniform pale ash-colour, a little darker towards the tips. Only one was produced at a time, and this clung by its hind claws to the lower part of the body of the mother, with its mouth usually attached to one of the two nipples situated on the breast, as shown in the figure on the next page. The young Fruit Bats born in confinement may be brought up, as Mr. Bartlett tells us, to display some fondness for the person who takes care of them and feeds them. They will then, if let loose, crawl about upon him, and even mount upon his shoulder and demonstrate their affection by licking his face after the fashion of a Dog. In the uneducated state, however, they bite viciously.

REPRESENTATION OF A FRUIT BAT ON AN EGYPTIAN MONUMENT.

THE INDIAN FLYING FOX.*

Southern Asia and its dependent islands may be regarded as the metropolis of the Fruit Bats. Here the species are most plentiful, and most numerously represented by individuals; it is here also that the largest species occur. One of the best-known is the Indian Flying Fox (*Pteropus medius*), some account of the habits of which, from the pen of Sir James Tennent, has already been given; and this species inhabits the whole of Hindostan, with the exception of the Punjab, Ceylon, Arracan, Tenasserim, and Pegu. It has been described by most writers under the name of *P. Edwardsii*, having been erroneously identified with a species inhabiting Madagascar and South-Eastern Africa. It measures about eleven inches in length,† and more than three feet in expanse of wing. As in all species of the typical genus *Pteropus*, of which it is the sole representative in the Indian peninsula, the tail in *P. medius* is entirely deficient, the tongue is of moderate size, and the molar teeth well developed—five on each side in the upper, and six in the lower jaw; the nostrils project, and are separated by a deep notch; the wing-membranes spring from the sides of the back, and are attached to the back of the first joint of the second toe; and the head and nape of the neck are covered with fur of a different colour from that of the rest of the upper part of the body. The latter is blackish or dark brown, with scattered greyish hairs. The nape of the neck and shoulders, the chest, and upper part of the abdomen are variable in colour from reddish-yellow or straw-colour to dingy rusty brown, the fur of the under surface being darker than that of the nape, and all the light tints darker in the females than in the males. The latter have usually a tuft of stiff hairs, of a light reddish-yellow colour, on each side of the neck. The ears, which are nearly naked, are acutely pointed, with the outer border concave just below the tip; the wing-membrane is dark brown, hairy beneath towards the body.

This species is referred to by nearly all writers on Indian zoology; but their accounts of its general habits agree closely with those given by Sir James Tennent, and already quoted. The Bats feed on fruits of various kinds, except oranges, according to Mr. Jerdon, and besides figs they are especially fond of the anonads, particularly the fruit of *Gualteria longifolia*, the soft parts of which

* *Pteropus medius.* † Colonel Sykes states that he had met with individuals more than fourteen inches long.

they devour, rejecting the kernels, with which the ground under the trees is speedily covered. According to Mr. F. Day, the fruit of the wild almond (*Terminalia catappa*) is also a favourite article of diet with them, and he adds, "they sometimes carry off the almonds into the verandahs of houses, where they extract the kernels, and in so doing frighten nervous people into the belief that robbers are endeavouring to effect an entrance." In search of these and other favourite fruits, they often fly to great distances during the night, returning with the dawn to their sleeping-places, when a scene of confusion takes place, which has been described as follows by Mr. Tickell:—"From the arrival

COLLARED FRUIT BAT WITH YOUNG. (From the *Proceedings of the Zoological Society.*)

of the first comer, until the sun is high above the horizon, a scene of incessant wrangling and contention is enacted among them, as each endeavours to secure a higher and better place, or to eject a neighbour from too close vicinage. In these struggles the Bats hook themselves along the branches, scrambling about hand over hand with some speed, biting each other severely, striking out with the long claw of the thumb, shrieking and cackling without intermission. Each new arrival is compelled to fly several times round the tree, being threatened from all points; and when he eventually hooks on he has to go through a series of combats, and be probably ejected two or three times, before he makes good his tenure." No doubt these squabbles are rendered more violent by the disgracefully dissipated habits in which the Bats indulge during their nocturnal expeditions, for, according to Mr. Francis Day and other observers, "they often pass the night drinking the toddy from the chatties in the cocoa-nut trees, which results either in their returning home in the early morning in a state of extreme and riotous intoxication, or in being found the next day at the foot of the trees sleeping off the effects of their midnight debauch."

The flesh is said by Colonel Sykes to be delicate, and without disagreeable flavour; but he states that the only persons in Western India who eat these Bats are the Portuguese residents. According to Mr. Jerdon, however, many classes in the Madras presidency also eat them.

THE GREAT KALONG.*

This, which is the largest of all known Bats, is an inhabitant of the great islands of the Eastern Archipelago, especially Java and Sumatra, where it exists in immense numbers. The species is also said to occur in the Philippine Islands and in Malacca. It is nearly allied to the Indian Fruit Bat, but grows to a larger size, attaining a length of about fourteen inches, and an expanse of wing of four feet and upwards. The colour varies considerably, but is generally brownish-black on the back, with the top of the head and the neck reddish-yellow, and tinged with chestnut-brown beneath. The muzzle, ears, and wing-membranes are black; the ears are shorter than in the Indian species, and the outer margin is less concave towards the tip; and the wing-membranes originate on the sides of the body at a greater distance from the centre of the back. Some of the varieties have been described as distinct species; two especially, in which the fur is entirely black, figure in the catalogues under the names of *Pteropus Pluto* and *P. funereus*.

The Kalong (see next page) was the first of the Indian Frugivorous Bats to be made known to European naturalists in modern times. It was described under the name of *Vespertilio admirabilis*, by Bontius, in his "Historia Naturalis Indiæ Orientalis." The species was also described and figured by Seba and other naturalists of the seventeenth century; but Linnæus, by a curious blunder, confused the references to this and allied species with the stories told of the American Vampire Bats, and described these Eastern fruit-eating forms as constituting a species under the name of *Vespertilio vampyrus*, the natural history of which he summed up in the following queer paragraph:—"Noctu haurit sanguinem dormientium servorum, cristas gallorum et lacrymas palmarum, phlebotomus felicissimus in pleuritide!" (By night it sucks the blood of sleeping slaves, the combs of cocks, and the juice of palm-trees, a capital lancet in pleurisy!) In its habits it closely resembles its Indian ally, resorting in great numbers to particular trees for the purpose of sleeping through the day, and starting forth at sundown in search of the fruits on which it feeds. Dr. Horsfield describes them as presenting a singular spectacle in their dormitories. "Ranged in succession with the head downwards," he says, "the membrane contracted about the body, and often in close contact, they have little resemblance to living beings, and by a person not accustomed to their economy are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches." He adds that they occasion "incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut which surrounds every dwelling of the meanest peasantry, to the rare and most delicate productions which are cultivated with care by princes and chiefs of distinction." In his history of Sumatra, Mr. Marsden states that he has observed very large flights of these Bats passing at a great height in the air, as if migrating from one country to another; and he adds that Captain Forrest noticed them crossing the Straits of Sunda from Java Head to Mount Pugong. The flesh of this species is eaten by the inhabitants of the countries where it abounds, who thus get some return for the mischief it does in their gardens and plantations. Its specific name (*edulis*) refers to this circumstance. Its name among the natives of Java is Kalong, and with the Malays of Sumatra and of the peninsula of Malacca Kaluwang, or Kluang.

THE NICOBAR, MANED, JAPANESE, AND GREY FRUIT BATS.†

It will be unnecessary to do more than refer to a few of the numerous species of *Pteropus* inhabiting the islands of the Eastern seas, as their habits in all cases are almost exactly alike, and it would be useless to attempt the bare description of a number of closely-allied species. The Nicobar and Andaman Islands in the Bay of Bengal have their peculiar species (*P. nicobaricus*), about the same size as the Indian Fruit Bat, but of which the females and young males are usually black all over,

* *Pteropus edulis.*

† *Pteropus nicobaricus, jubatus, dasymallus,* and *griseus.*

whilst the male has a reddish or chestnut-coloured tippet. The Philippine Islands have a rather remarkable species, the Maned Fruit Bat (*P. jubatus*), the head of which is shown in one of our illustrations on the next page. Japan possesses a smaller form (*P. dasymallus*), about eight inches long, which is characterised by the woolly nature of its fur, as indicated in its specific name. Those islands of the Eastern Archipelago from Celebes to New Guinea and the Solomon Islands which, according to Mr. Wallace, belong to the great Australian region, are abundantly supplied with fruit-

KALONG.

eating Bats, such as the Grey Fruit Bat (*P. griseus*, see next page), a small species which inhabits Timor and Amboyna. The small islands scattered over the ocean to the east also possess their peculiar species.

THE GREY-HEADED FRUIT BAT.*

The northern and eastern parts of Australia are inhabited by a large species of *Pteropus*, the Grey-headed Fruit Bat (*P. poliocephalus*). This Bat measures about a foot long, and has an expanse of wing of about three feet. The head, cheeks, and throat are ash-grey, with a few scattered black hairs; the nape, part of the front of the neck, and the shoulders are bright reddish-brown, and separated by a black band from the grey fur of the body. These Bats, according to Dr. Bennett, are found in

* *Pteropus poliocephalus.*

great numbers about Moreton Bay and the northern districts of New South Wales. They could be observed "hanging in dense clusters from the uppermost branches of the lofty gum and other trees, which often bend so much under the weight, that the spectator is in momentary expectation of their breaking off with a crash, and falling to the ground encumbered with their heavy load of Bats." The same observer remarks that, although their regular activity is crepuscular and nocturnal, they occasionally seek food for a short time during the day, and he adds when seen flying about the trees in the daytime they resemble rooks so closely as to have been frequently mistaken for those birds. Since the cultivation of fruit has been carried on extensively in New South Wales and Queensland, these Bats have been found to do a vast amount of injury to the plantations.

Mr. Gould, speaking of this Bat, says, "The enormous number that may be seen sleeping pendent from the trees in the more secluded parts of the forest are beyond conception. It is not surprising, therefore, that the settlers whose abodes may be in the neighbourhood of one of these colonies should find their peach-orchards devastated in a single night. Indeed, no one of the native animals is more troublesome to the settlers than this large Bat, which, resorting to the fruit-grounds by night, when it is impossible to protect them from its attacks, commits the most fearful havoc." Like the Indian species, this Bat is exceedingly fond of the wild fig.

HEAD OF THE MANED FRUIT BAT.

HEAD OF THE GREY FRUIT BAT.

GOULD'S FRUIT BAT.*

Mr. Gould described and figured from Northern Australia a large species of Fruit Bat of a sombre colour, with a reddish-brown neck-spot, which he identified with the *Pteropus funereus* of Timor, a supposed species which is now regarded as a mere colour-variety of the Great Kalong. The Australian Bat is described by Professor Peters as a distinct species under the above name. It is about nine inches in length. We have the following observations upon its mode of occurrence and habits:—Mr. Gilbert found it to be extremely abundant in the Coburg peninsula. During the day the Bats were seen suspended in great numbers from the upper branches of the mangroves overhanging the creeks. They constantly emit a very strong and disagreeable odour, which is perceptible at a considerable distance. At night they become exceedingly active, and while flying about in quest of food they utter a loud, trembling, but shrill whistle.

Dr. Leichardt, in his expedition from Moreton Bay to Port Essington, found this Bat an excellent article of food. According to him it feeds upon fruit and the honey of various flowers. After it had fed upon the flowers of the so-called tea-tree, he found it to be unusually fat and delicate; while those Bats which had been revelling among the blossoms of the gum-trees were not so fat, and had a strong unpleasant odour. In the neighbourhood of the River Roper the Bats occurred in myriads, suspended in thick clusters on the highest trees in the shady and moist parts of the valley. They started from their repose as the travellers passed, and the flapping of their great leathery wings produced a sound like that of a hail-storm.

* *Pteropus Gouldii.*

THE ROUSSETTE.*

The so-called Mascarene Islands, Mauritius and Bourbon, those specks in the great Indian ocean which, when first discovered, harboured so many curious birds, also furnished one of the earliest known species of Fruit Bats, the Roussette (*Pteropus vulgaris*, see next page), which was described by Gesner and Clusius. This species, which is said to occur also in Madagascar, and even on the mainland of Africa, is about eight and a half inches long, and three feet in expanse of wing. The muzzle, forehead, and cheeks are rusty red; the crown of the head, the nape, and the sides and front of the neck yellowish-red; and two longitudinal bands of the same colour run parallel to each other down the middle of the back, separated by a strip of blackish chestnut, which, with the similarly coloured shoulders, forms a sort of cross; the sides of the back are rusty red, and the lower surface of the body black. It is probably to the generally reddish tinge of its fur that this species owes its French name of Roussette, which has been extended in its application to the whole of the Frugivorous Bats.

THE EGYPTIAN FRUIT BAT.†

The majority of the African Fruit Bats belong to genera which have been separated from the old genus *Pteropus*. Thus we have several species of *Cynonycteris* (*Xantharpyia* and *Eleutherura* of the late Dr. Gray), in which the characters are generally those of *Pteropus*, but there is a short tail more or less enclosed in the interfemoral membrane, and the basal portion of the thumb is joined to the index finger by a membrane. To this genus belongs the Egyptian species already referred to (*Cynonycteris aegyptiaca*), representations of which occur on Egyptian monuments (see page 269). This species is about five and a half inches long, with an expanse of wing of eighteen or twenty inches; the tail is rather more than half an inch long, and the basal half of it is enclosed in the interfemoral membrane; the ears are rather long, rounded at the tips, and naked; the upper surface of the body is pale greyish-brown, becoming yellowish on the sides and the hairy part of the arms, and the lower surface is whitish. These Bats are found abundantly in Egypt, where they dwell amongst the ruins of its ancient edifices, and in the dark chambers of the Pyramids. They also occur in Senegambia in Western Africa, and in Syria.

THE HOTTENTOT FRUIT BAT.‡

An abundant species of South Africa is the Hottentot Fruit Bat (*Cynonycteris collaris*), specimens of which may be seen in the Zoological Gardens, where they breed pretty freely. This species varies considerably in colour, but usually displays various shades of reddish or greyish-brown. The fur is less dense on the nape of the neck, which in consequence generally has a rather bare appearance. This Bat occurs at the Cape of Good Hope, in Caffraria, and in Mozambique.

THE MARITIME FRUIT BAT.§

These tailed Fruit Bats are represented in the East Indian region by several species, which gives the genus *Cynonycteris* a geographical range from the Philippine Islands in the north-east to the Cape of Good Hope in the south-west. The best-known Indian species (*Cynonycteris amplexicaudata*), is nearly allied to the Egyptian form, but smaller, being little more than four inches in length. Its fur is reddish-brown, or brownish-red above, and so short upon the back that this part appears nearly bare. The range of this Bat extends from the shores of the Persian Gulf to the Philippine Islands, and it appears always to haunt the coasts. As already stated this Bat is supposed by some zoologists to feed on mollusca and other marine animals picked up on the seashore.

* *Pteropus vulgaris.* † *Cynonycteris aegyptiaca.* ‡ *Cynonycteris collaris.* § *Cynonycteris amplexicaudata.*

THE MARGINED FRUIT BAT.*

In the *Cynopteri*, which are small Fruit Bats inhabiting Southern Asia and its islands, the characters are very similar to those of the preceding genera, but the muzzle is considerably shorter and more Dog-like, and one of the true molars is deficient, so that the whole series of molar teeth contains four on each side in the upper, and five on each side in the lower jaw. The most abundant

ROUSSETTE.

species is the *Cynopterus marginatus* (see next page), which is about four inches in length, and varies in colour through different shades of brown and reddish-brown. It is specially distinguished by having the ears surrounded by a white border. This Bat occurs in all parts of India, in Ceylon, in Further India, and in the eastern islands to Celebes and the Philippines. It is exceedingly common, and very destructive to fruits, especially guavas, plantains, and mangoes. Mr. Dobson gives the following account of the voracity of a specimen obtained by him at Calcutta:—He gave it "a ripe banana, which, with the skin removed, weighed exactly two ounces. The animal immediately, as if famished with hunger, fell upon the fruit, seized it between the thumbs and the index fingers, and took large mouthfuls out of it, opening the mouth to the fullest extent with extreme voracity. In the space of three hours the whole fruit was consumed. Next morning the Bat was killed, and found to weigh one ounce, half the weight of the food eaten in three hours! Indeed, the animal when eating seemed to be a kind of living mill, the food passing from it almost as fast as devoured, eating being performed

* *Cynopterus marginatus.*

alone for the sake of the pleasure of eating." It is hardly fair, perhaps, to apply the character of this disgusting little gormandiser to his whole species, but no doubt if the rest of his kind only approximate to his prowess, they must do incalculable mischief in the plantations of fruit-trees. According to Captain Hutton, these Bats travel long distances, as much as thirty or forty miles in search of food, and back again the same night. This is most strikingly shown in their frequenting the valleys of the Dehra Doon and Nepaul to feed on the guavas growing there, as they are never seen in these localities during the day, but arrive there during the fruit season about midnight, and depart again before morning. "To reach Dehra," says Captain Hutton, "they must either cross the Sivalik range of hills, from 3,000 to 3,500 feet high, or thread their way for miles through the passes leading into the Doon, though even then we may ask with amazement how, when they are approaching the Sivaliks, they can tell that there is fruit some twenty miles in advance of them! To reach the valley of Nepaul at 6,000 feet of elevation they must ascend and descend the mountains; and yet, wonderful to say, they penetrate no farther into the hills, neither do they descend from the Doon to Mussooree, apparently instinctively knowing that they will find no guavas farther in the hills! Almost equally astonishing is it that, having thus feasted in the Doon and Nepaul, they should be able to find their way back again, through forests and hills, for thirty or forty miles to their natural haunts in the plains." Captain Hutton fully confirms Mr. Dobson's statements as to the greediness of this Bat. He says that one he had "in Calcutta in 1849 appeared to be almost incessantly eating, resting only, even during the day, for a short interval of sleep, and then recommencing upon ripe guavas, as if it had not seen food for a fortnight."

HEAD OF THE MARGINED FRUIT BAT.

WHITE'S FRUIT BAT.*

A series of peculiar species are inhabitants of the continent of Africa, from the Northern tropic to the Cape of Good Hope. They have the muzzle rather elongated, the molar teeth three on each side in the upper, and five on each side in the lower jaw, the base of the thumb united to the index finger by membrane, and the tail very short and chiefly enclosed in the small interfemoral membrane. The males have tufts of divergent white hairs on the shoulders, whence the generic name of *Epomophorus*, applied to these Bats, has been derived. The best-known species is the *Epomophorus Whitii*, an inhabitant of Western Africa (Senegambia and Guinea), which measures about six and a half inches in length, and has an expanse of wing of about eighteen inches. Its fur is reddish-brown above, and greyish beneath, and both sexes present white spots at the base of the ears.

THE HAMMER-HEADED BAT.†

A species presenting so grotesque an appearance that it might almost have served as the original of one of Callot's demons (see next page), was discovered some years ago in Western Africa, by M. Du Chaillu, and described by Dr. Allen, of Philadelphia. It is allied to *Epomophorus*, but differs from all other Pteropine Bats in the extraordinary size and shape of the head, which has a hammer-like appearance, owing to the muzzle being enormously developed and cut off abruptly in front, and the whole of this part of the animal is garnished with curious fleshy lobes, which give it a most singular aspect. The length of the head and body is about twelve inches, and the expanse of the wings twenty-eight inches. Of its habits nothing appears to be known.

THE HARPY BAT.‡

The Harpy Bat (*Harpyia cephalotes*), is a remarkable species, having a short and rounded head, with the nostrils wide apart and somewhat tubular, and a very peculiar dentition, there being

* *Epomophorus Whitii.* † *Hypsignathus monstrosus.* ‡ *Harpyia cephalotes.*

only two incisor teeth in the upper jaw, and none in the lower, while the upper jaw has only four and the lower one six molars. This Bat, the Molucca Bat of Pennant and Shaw, inhabits the islands of Celebes and Amboyna. It is nearly four inches in length, and has an expanse of wing of about fourteen inches.

Mr. Dobson has recently described a second species of Harpy from Duke of York Island, near New Guinea, which may be called the Greater Harpy Bat (*Harpyia major*). It is much

HAMMER-HEADED BAT.
From the *Proceedings of the Zoological Society*, 1870.

larger than the above species, and is especially remarkable for the great length of the nasal tubes. The general colour of the fur is pale buff.

THE CLOAKED FRUIT BAT.*

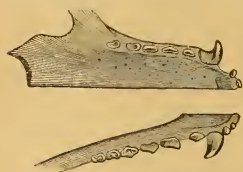
This is another very curious Bat which inhabits Amboyna, but is also met with in Timor and Banda. It differs from all the preceding forms by wanting the claw at the extremity of the first finger, and is further remarkable by having the wing-membranes springing from the middle line of the back, so as to form a complete mantle for the animal. In the form of the head, this Bat resembles the true *Pteropi*, but the dentition approaches that of *Harpyia*, the incisors being usually two in each jaw, and the lower ones sometimes deficient, and the molars four and six in the upper and lower jaws

* *Cephalotes Peronii.*

respectively. This Bat is about six inches long, with an expanse of wing of rather more than two feet. The colour of the fur in adult animals is generally olive-grey, often with a brownish tinge, and the wing-membranes are ligat brown and translucent. The tail is short, and about half enclosed in the interfemoral membrane.

THE DWARF LONG-TONGUED FRUIT BAT.*

The remaining forms of the Frugivorous Bats to which we have to refer constitute a peculiar group, characterised by having the tongue very long, thin, capable of being pushed far out of the mouth, and covered with peculiar recurved, brush-like papillæ, and the molar teeth very small and scarcely raised above the surface of the gum (see figure below). From the great length of the tongue, the name of *Macroglossus* was applied by F. Cuvier to the first species of this group that was discovered; and, as it is the smallest species of the family, it received from its original describer the specific name of *minimus*. The *Macroglossus minimus* is, in fact, a mere dwarf in comparison with the large Bats which constitute the majority of the Pteropidæ, measuring only from two and a half to three inches in length, with an expanse of wing of from eight to ten inches. The muzzle is long and narrow, with the nostrils not projecting; the index finger has a claw at its tip; the wing-membranes spring from the sides of the body, and run down to the base of the fourth toe; and the tail is very short, free from the interfemoral membrane, but usually concealed beneath the fur. The colour of the fur is reddish-brown. The tongue is said to be two inches long. This little Fruit Bat occurs upon the Himalayas, at Darjéling, and extends thence through Burmah and Siam to the islands of the Eastern Archipelago, and as far south as the northern and western parts of Australia. According to Dr. Horsfield, this species, although far less abundant in Java than the great Kalong, exists there in sufficient numbers to inflict serious injury upon the plantations of fruit-trees. It particularly affects the most succulent fruits, such as those of various species of *Eugenia*, known in Java as Jamboo. Probably the peculiar structure of the tongue has some connection with this soft, juicy diet.



TEETH OF THE DWARF LONG-TONGUED FRUIT BAT.

THE BLACK-CHEEKED FRUIT BAT.†

Among the Bats from Duke of York Island, north-east of New Guinea, lately described by Mr. Dobson, there is a most characteristic species of the long-tongued group, which may be called the Black-cheeked Fruit Bat. It has the long thin tongue, armed with brush-like papillæ, of *Macroglossus*, the nostrils bounded at the sides by naked raised edges, the metacarpal bone of the middle finger as long as the whole index finger, the wing-membranes starting from the sides of the body and from the back of the middle toe. In the number of the teeth it agrees with *Macroglossus*, but differs somewhat in the position of the pre-molars, the first of which are very small and placed close to the canines, while the second and third are separated from this and from each other by considerable interspaces. We have no information as to the habits of this Bat, which is figured on the next page.

THE FIJIAN LONG-TONGUED FRUIT BAT.‡

The only other species of this group was described by the late Dr. Gray, under the name of *Nctopteris Macdonaldii*, and it is interesting as reproducing the peculiar character presented by *Cephalotes* of having the wing-membranes springing from the middle of the back. In the structure of the tongue it agrees with *Macroglossus;* but it has no claw on the first finger; its tail is elongated; and it has only two incisors in each jaw, and four molars on each side in the upper, and five in the lower jaw. This curious Bat is an inhabitant of the Fiji Islands.

* *Macroglossus minimus.* † *Melonycteris melanops.* ‡ *Notopteris Macdonaldii.*

BLACK-CHEEKED FRUIT BAT.
From the *Proceedings of the Zoological Society*, 1877.

SUB-ORDER II.—MICROCHIROPTERA, OR INSECTIVOROUS BATS.

CHAPTER III.

HORSESHOE BATS AND MEGADERMS.

INSECTIVOROUS BATS—Mr. Dobson's Objection to the Name—Characteristics—Nasal Appendages—THE VESPERTILIONINE AND EMBALLONURINE ALLIANCES—The Fur in the Two Alliances—THE HORSESHOE BATS—General Characteristics—Distribution—Diet—Carnivorous Propensities—GREATER HORSESHOE BAT—General Appearance—"Nose Leaves"—Habitat—THE LESSER HORSESHOE BAT—Habitat—THE MOURNING HORSESHOE BAT—THE AUSTRALIAN HORSESHOE BAT—THE ORANGE BAT—PHYLLORHINÆ—THE DIADEM BAT—Character of their "Nose Leaves"—Captain Hutton's Account of their Habits—THE PERSIAN TRIDENT BAT—THE MEGADERMS—THE LYRE BAT—Characteristics—Called Vampire by Europeans in India—Mr. Blyth's Account of a Megaderm's Blood-thirstiness—The CORDATE LEAF BAT—THE AFRICAN MEGADERM—THE DESERT BAT.

THE second sub-order of Bats—which includes a much larger number of species, displaying a far greater variety of characters than those which have hitherto occupied our attention—has received the name of *Insectivora*, from the general nature of the diet of the animals composing it. Mr. Dobson objects to this name, chiefly on account of there being already an *order* of Mammalia bearing the same designation; and he proposes to call these Bats *Microchiroptera*, in allusion to the small size of most of the species in comparison with the majority of the Pteropidæ. Moreover, although the food of most of these Bats consists exclusively of insects, some of them feed, at least partially, upon other vertebrate animals, and a few are known to eat fruit.

The Bats belonging to this second sub-order may be at once distinguished by the structure of their molar teeth, which are armed with acute tubercles, separated, more or less completely, by transverse furrows. The ears also differ from those of the Pteropidæ, in that the two margins of the conch start from different points on the surface of the head, and, in a great number of cases, they are complicated by a membranous lobe, springing from near their base, or by a great development of the tragus, or anterior lobe of the ear. The tail in these Bats is generally well developed, and the index finger is never terminated by a claw.

A considerable number of Insectivorous Bats of different families have their noses furnished (we

cannot say adorned) with curious leaf-like appendages, often of most complicated construction (see some of the illustrations), and these organs, as has already been stated, probably assist materially in the exercise of that delicate sense of touch which supplements or takes the place of the power of vision in guiding the Bats in their obscure abodes. In general, the presence or absence of nasal appendages being an exceedingly obvious character, has been adopted by zoologists as the means of classifying these Bats, and the order has been commonly divided into two groups—the Istiophora, or those with a nose-leaf, and the Gymnorhina, or Anistiophora, in which there is no such appendage. Mr. Dobson, who has devoted a great deal of attention to the Chiroptera, finds, however, that by following this system certain forms are grouped together which have little in common, whilst in other cases real affinities are lost sight of, and he suggests another mode of division, which, for many reasons, appears to be the most natural that has hitherto been proposed. He ranges the families of his Microchiroptera in two alliances, the leading characters of which may be briefly indicated as follows :—

In the first, or *Vespertilionine alliance*, so called from its including our common Bats (*Vespertiliones*), the tail is generally long, never absent, and always entirely enclosed in the interfemoral membrane, with the exception of the extreme tip, which projects a very little ; the pre-maxillary bones are rudimentary, and the upper incisor teeth which they carry small and weak ; and the first phalanx of the middle finger is extended in repose in a line with the metacarpal bone.

In the second, or *Emballonurine alliance*, so called from one of the genera included in it, the tail, which is frequently absent or short, except in two or three species, is not contained within the interfemoral membrane, but has its extremity free, usually perforating the membrane and appearing on its upper surface. The pre-maxillary bones are generally well developed, and the incisors large ; and the first phalanx of the middle finger is folded forward in repose above or below the metacarpal bone.

The character derived from the condition of the middle finger in repose seems to be regarded as of the most importance by Mr. Dobson, who says that it is connected with differences in the habits of the animals ; but those of the tail and incisor teeth will be most useful to the student in determining to which alliance he is to refer his specimens ; and, although they are liable to exceptions in the second group, will never *both* fail in the same individual.

A striking confirmation of the naturalness of this arrangement is to be found in the fact that even the microscopic character of the fur differs in the two alliances. In the first, the longer hairs of the fur when magnified show a series of scales, imbricated or partly overlapping each other, something like the grains of corn in the ear, the tips, which are not acute or very prominent, forming a sort of spiral line round the surface of the hair (see Fig. *a*). In the second alliance, on the contrary, the scales—which are smaller and narrowed, with acute and projecting tips—are arranged in rings round the hair, giving it a somewhat jointed appearance (see Fig. *b*). Mr. Dobson has examined the fur of a majority of the genera of these Bats, and also submitted his specimens to the examination of Dr. J. D. Macdonald, F.R.S., and both these gentlemen find the differences in the structure of the hair always perfectly in accordance with the arrangement above indicated, with but two exceptions, one of them being a genus which really forms a sort of connecting link between the two alliances, and the other having fur quite different from that of any other Bat, and in which the scales can hardly be distinguished.

a *b*

HAIRS OF BATS, MAGNIFIED.

(From *Dobson's "Monograph of Asiatic Bats."*)

VESPERTILIONINE ALLIANCE.

FAMILY II.—RHINOLOPHIDÆ, OR HORSESHOE BATS.

The Bats of this family are usually called Horseshoe Bats, from the circumstance that their noses are furnished with leaf-like membranous appendages of rather complicated structure, the front part of which is usually something like a horseshoe in its form (see figure on next page). The nostrils are situated within this horseshoe, between it and the other parts of the nose-leaf, which vary considerably in their shape and structure. The middle finger has two phalanges, or joints, beyond the long metacarpal bone,

a character common to all the Bats of this alliance, with only a single exception; and *the ears have no tragus*. Throughout the family there are two small incisor teeth in the upper jaw, and four in the lower, and three true molars on each side in both jaws; but the number of pre-molars varies, being usually two on each side in the upper jaw, and either two or three in the lower; whilst in one curious species the upper pre-molars are only one on each side.

The *Rhinolophidæ* are confined to the Eastern hemisphere, of which they chiefly inhabit the warmer parts. They are generally insectivorous in their habits, but some of the larger species are said to prey upon other vertebrate animals, and not even to spare their smaller brethren. Thus, Mr. Frith informed Mr. Blyth that "a number of these Bats were in the habit of resorting to the verandah of his residence in Mymensing (Burmah), and that every morning the ground under them was strewed with the hind-quarters of Frogs and the wings of large Grasshoppers and Crickets. On one occasion the remains of a small fish were observed; but Frogs appeared to constitute their chief diet—never Toads, and of a quiet evening these animals could be distinctly heard crushing the heads and smaller bones of their victims."

HEAD OF THE GREATER HORSESHOE BAT

Captain Hutton also states that various species of *Rhinolophidæ*, and some *Vespertilionidæ*,* when confined with some smaller species than themselves, will prey upon them; and he suggests that these carnivorous propensities may be "the reason why the larger species keep aloof in pairs, instead of congregating, as do some of the smaller kinds." In illustration of this suggestion he gives the following interesting account of a cave frequented by Bats:—He says, "I know of an enormous cave at Mussooree, to which various species, both large and small, are in the habit of resorting for rest and concealment during the day. Standing within this spacious vault in the earliest hours, just before the first streaks of day appear, the spectator is perfectly astonished at the numbers of Bats resorting to it; not, however, in one promiscuous crowd, but in separate detachments, each seeking its own particular quarter of the cavern, and alighting against the sides, at first within reach of a Butterfly-net, and commence crawling upwards and backwards to spots beyond the reach of invasion from below. Here, in one spot, will be seen a pair of *Rhinolophus luctus*, hanging high up, and quite apart from all the rest; in another place hangs a pair of *Phyllorhina armiger*, the large ears and the facial crests in active tremulous motion as the head is turned in every direction to ascertain that no intruder is nigh its dwelling-place, until, this restlessness gradually passing off, the animal hangs at length quietly suspended by the feet. In another direction are a dozen or more of *Rhinolophus minor*, rapidly scrambling all together, like a lot of crabs, up the inequalities of the rocky surface, and hurriedly disappearing into some deep, narrow crack or crevice; while again, in another part, the same scene is observed, as dozens of a very small species of *Nycticejus* (*Scotophilus*) scramble into similar hiding-places, to rest in peace until the hour for again emerging in search of prey calls them all forth once more."

THE GREATER HORSESHOE BAT.†

Although, as already stated, most of the Horseshoe Bats inhabit warm countries, several species are found in more temperate regions. One of these is the Greater Horseshoe Bat (*Rhinolophus ferrum-*

* *Rhinolophus luctus*, *Phyllorhina armiger*, *Nycticejus luteus* (=*Scotophilus Temminckii*), *Miniopterus blepotis*, and *Vespertilio Blythii*.

† *Rhinolophus ferrum-equinum*.

equinum, which occurs, although not very abundantly, in various parts of the South of England. He is a puffy and rather pursy-looking little fellow, with a head which appears full large for his body. The length of his head and body is about two and a half inches, and that of his tail, which is entirely enclosed in the interfemoral membrane, about an inch and one-third. His wings have an expanse of thirteen or fourteen inches. The fur on the upper surface is reddish-grey, and on the lower surface very pale grey; the membranes are of a dingy brown colour, and the ears and nasal appendages pale brown. The ears are large, broad at their attachment to the head, pointed and turned outwards at the apex. From the outer margin ten or a dozen transverse furrows run towards the middle of the ear. The outer margin, at its junction with the head, is also continuous with a low rounded lobe* which bounds the aperture of the ear in front, and may be used to close the cavity. The nasal appendages, or "nose-leaves," are very curious and complicated (see figure, p. 281).

GREATER HORSESHOE BAT.

The anterior, or horseshoe-shaped portion, lies longitudinally upon the nose, and is formed of three concentric elevations, the innermost of which bounds the depression in which the nostrils are placed. Between the nostrils arises the central process, the anterior portion of which forms a sort of cup, behind which the process is slightly narrowed and excavated, but again widens before terminating in a short but rather sharp point. This point overhangs the third, or frontal leaf, which touches the horseshoe portion, and is about as broad as the latter at their junction, and tapers up to a point upon the forehead. The eyes, which are like little black beads, are placed on each side of the junction of the horseshoe and the frontal leaf.

These curious structures are found with slight variations in all the species of the genus *Rhinolophus*, to which this Bat belongs. The nasal appendages vary somewhat in the form and proportions of their parts, and the basal lobe, or antitragus of the ears, is developed in different degrees in various species, but their general character is always recognisable. Other marks by which the species of this genus may be recognised are the presence of three joints in the first toe, the others possessing only two, and the dentition, which includes the full number of teeth developed in the family, namely, incisors, $\frac{2}{4}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{2-2}{3-3}$, molars, $\frac{3-3}{3-3}$.

The Greater Horseshoe Bat lives chiefly in deserted quarries, old buildings, and natural caverns,

* To this lobe the name of "antitragus" has been given.

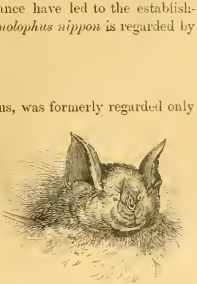
and is said to frequent the darkest and most inaccessible parts of such excavations. Thus, Montagu found it in company with the smaller species next to be described, in "Kent's Hole," near Torquay, "a retreat," says Mr. Bell, "so dark and gloomy, that no other species, even of this lucifugal family, were found to frequent it." In such retreats it passes the winter in a torpid state, coming forth in the spring to prey upon the insects which constitute its sole nourishment. It is said often to feed upon chafers, but to eat only the body. That it does not disdain smaller game, however, appears from Pennant's record of its original discovery in England by Dr. Latham, who obtained it at Dartford, in Kent, where, says Pennant, "they are found in greatest numbers in the saltpetre houses belonging to the powder-mills; and frequent them during the evening for the sake of the Gnats which swarm there. They have also been found during winter, in a torpid state, clinging to the roof." Mr. James Salter, in a communication to Mr. Bell, mentions his having caught one of these Bats on the 29th of September, 1865, in so appropriate a locality as the "haunted room" at Tomson Manor House, Dorsetshire. It was flitting about the room when he went to bed, having entered by an open window. "On the next three nights, which were still and calm," he says, "I saw numbers of (apparently) the same Bats flying around the house among a grove of sycamores. The flight was low, short, and sluggish, both in the room and out of doors."

This Bat suckles its young, after the usual fashion of Bats, at the two pectoral teats. Several authors, and among others Geoffroy, have maintained that the Horseshoe Bat, and indeed all the species of the family to which it belongs, possess, besides the ordinary pectoral teats, a second pair situated on the groin. This, however, is not the case, for the nipple-like appendages situated on the groin in the females of this group have been proved to have no connection with any mammary glands.

In England the Greater Horseshoe Bat has been found in various localities in the southern counties. Besides Dartford, where it was originally discovered in this country, Mr. Bell mentions Margate, Rochester, and Bristol Cathedrals, Colchester, caverns at Clifton, and the Undercliff of the Isle of Wight. On the continent of Europe it inhabits the whole of the southern and central parts from Spain and Portugal in the west, to Greece and Turkey in the east, extending northwards as far as central Germany and southern Russia. In Asia it is found in Syria and Asia Minor, and ranges thence eastwards to Nepaul and Mussooree; whilst in Africa it appears to stretch from Algeria to the Cape of Good Hope. Over this wide range, as might be expected, the species does not always display precisely the same characters, and variations of greater or less importance have led to the establishment of supposed distinct species; amongst others, the Japanese *Rhinolophus nippon* is regarded by Mr. Dobson as identical with our Greater Horseshoe Bat.

THE LESSER HORSESHOE BAT.*

The Lesser Horseshoe Bat, the second British species of this genus, was formerly regarded only as a small variety of the preceding, and was first distinguished by Colonel Montagu, who also first detected its occurrence in England. It is about half an inch shorter than the Greater Horseshoe Bat, and its expanse of wing is about nine inches. In general aspect it resembles the larger species. The fur is equally soft and full, and of the same colours, except that the upper surface is a little browner, and the lower parts rather more tinged with yellow. In the ears the transverse furrows are scarcely perceptible, and the basal lobe is rather larger in proportion. There are also some small, but constant, peculiarities in the structure of the nasal appendages. The central leaf is less prominent and less cupped at the base than in *R. ferrum-equinum*: the frontal leaf is lance-shaped, and not much dilated at the sides towards the base; and the outer margin of the horseshoe is slightly crenulated (see figure).



HEAD OF LESSER HORSESHOE BAT

In its habits this kind seems to agree with the Greater Horseshoe Bat. As already men-

* *Rhinolophus hipposideros.*

tioned, the two species were taken together by Montagu in "Kent's Hole," clinging in considerable numbers to the vaulted roof of the interior apartments. It was first discovered by him in rather a singular situation, namely, a hole over a baker's oven, which it had entered through a fissure. He afterwards found it in a dark shed surrounded by tall trees, at Lackham, in Wiltshire. In the second edition of Mr. Bell's "British Quadrupeds" there is an interesting account of the manners of this species. The writer mentions the occurrence of the Lesser Horseshoe Bat in two localities in Warwickshire, one of these being the roof of the neglected mansion of the Marquis of Hertford at Ragley, near Alcester. Numbers of Long-eared Bats were found, chiefly in pairs, in holes in the massive timbers, but "although several of the Horseshoe Bats were seen flitting in the deep gloom, broken only by an occasional gleam of light through some small crevice, and by our lighted candle, yet a careful search was for some time unrewarded by the discovery of a single individual in its resting-place. A great accumulation of excrement around a huge central stack of chimneys at length attracted attention, and a long stick, thrust upwards in a narrow opening between the chimneys, soon dislodged several of these Bats, which were caught as they descended, and before they were well on the wing, after which pursuit proved useless. Some of these examples being at various times liberated in a room, exhibited extraordinary powers of flight. One of them displayed in its search for a means of exit an ability which was quite extraordinary. It literally flew into every part of the room, and behind and under everything, even under a bookcase standing against a wall, although there was scarcely a space of three inches between it and the floor . . . . it flew into a vacancy occasioned by the removal of a moderate octavo volume, without having so much as touched anything with the tips of its wings." In examining the window this Bat searched every pane inch by inch, its wings while thus occupied being "kept in a vibratory state, the face of the animal being directly in front of the glass, and very near to it, as if looking out of window." The impression produced on the observers was that the animal was "feeling its way about like a blind person;" but "at the same time its shyness when approached sufficiently testified that its organs of sight were by no means inactive." In order to rest, instead of adhering like most other Bats against some object by means of its claws, it always sought for something from which it could hang freely. According to Dr. Leach this Bat is easily tamed, but is fond of concealing itself.

Besides the English localities already mentioned, the Lesser Horseshoe Bat is found not unfrequently at Cirencester and in some parts of Ireland. Professor King obtained it in Galway; and from the statements of Mr. Foot and Professor Kinahan it appears to be the commonest Bat in some parts of County Clare. Its European distribution is much the same as that of the preceding species, but it seems to extend rather farther to the north. It is also found in the Caucasus and in South-western Siberia. North African specimens are said to be paler in colour than European.*

HEAD OF THE MOURNING HORSESHOE BAT.

THE MOURNING HORSESHOE BAT.†

Other species of *Rhinolophus* are met with chiefly in India and the Asiatic Islands. One of the most striking of them, and indeed the largest species of the genus, measuring more than three and a half inches in length, is the Mourning Horseshoe Bat (*Rhinolophus luctus*, see figure), an inhabitant of the higher grounds of India, Ceylon, Java, Sumatra, and the Philippine Islands. This Bat is remarkable for the great development of the nasal appendages, the central leaf being expanded on each side into a lobe nearly as long as the central ascending portion, the horseshoe very large, so as to project beyond the upper lip, and the frontal leaf so long as to ascend between the ears. The latter organs are also of

* Besides the two species found in Britain, two others inhabit southern Europe, the Levant, and Northern Africa, namely, *Rhinolophus euryale* and *R. Blasii*, the latter often described under the name of *R. clivosus*. Both these species are nearly allied to the English Horseshoe Bats.

† *Rhinolophus luctus.*

great size, and have a large basal lobe (antitragus) separated from the outer margin of the ear by a deep angular notch. The fur is very long and thick, and usually black with grey tips, so that the species appears to be in mourning, whence its specific name; it is, however, subject to considerable variation in this respect, some specimens being reddish-brown. Captain Hutton, who resided for a considerable time at Mussooree, has described the habits of this Bat, which he found in the Himalayas up to an elevation of 5,500 feet, where it was "hanging from the roof of an outhouse, looking, with its ample black wings folded round it as a cloak, somewhat like a large black cocoon." He says that it commences its flight rather early in the evening, and generally keeps at about twenty or thirty feet from the ground, wheeling, with a somewhat heavy and noiseless flight, around buildings and large trees in search of small Moths and other insects. He adds that he has taken them from the roofs of outhouses and from wide caves in limestone rocks, and that they seem generally to live in pairs and not in communities, although several pairs may be found in a large cave. At Mussooree they fly only during the

ORANGE BAT.

warmer months, and remain in a semi-torpid state during the winter, but Captain Hutton suggests that in the warmer climates of Sikkim and the Khasia hills they may be active all the year round. Another smaller species with a similar central nose-leaf has been described under the name of *R. trifoliatus;* it is an inhabitant of the eastern coast of India, Java, and Borneo. These two species form the genus *Aquias* of the late Dr. Gray.*

THE AUSTRALIAN HORSESHOE BAT.†

A single species of *Rhinolophus* occurs in Australia, having been obtained from caverns on the Murrumbidgee River, and also near Richmond River in New South Wales. It has pale mouse-coloured fur. The ears are large, with long basal lobes, and the nasal appendages are larger than in the European species, the frontal leaf being lance-shaped and long, and the horseshoe rather deeply

* The commonest of the numerous Eastern species of the genus are Pearson's Horseshoe Bat (*R. Pearsonii*), which has a very large nose-leaf and greatly developed ear lobes, and is found throughout the lofty hill-countries from the Himalayas to the mountains of Burmah and China; Roux's Horseshoe Bat (*R. affinis*), which varies in colour from orange-brown to greyish-brown, and is found among the hills all over India, and in Ceylon, Burmah, Java, Sumatra, and Borneo; and the Dwarf Horseshoe Bat (*R. minor*), only about one inch and three-quarters in length, which occurs in Burmah, Yunnan, Java, Sumatra, Borneo, and Japan. Several varieties of the last two species have been described as distinct forms.

† *Rhinolophus megaphyllus.*

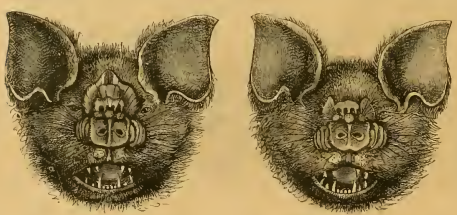
notched in front. In allusion to the large size of the nose-leaves this species has been called *R. megaphyllus*.

THE ORANGE BAT.*

Another Australian species of Leaf-nosed Bat, belonging, however, to a distinct genus, of which, indeed, it is the sole representative, is the Orange Bat (*Rhinonycteris aurantia*, see p. 285). This species, which is about two inches long, is clothed with a soft fur, which, in the male, is of a bright orange colour, and in the female pale yellow. This coloration is exceedingly remarkable in an animal of nocturnal habits, as these are generally rather sombre in their tints. The nose-leaf in the Orange Bat is somewhat similar in its character to that of the true *Rhinolophi*, but in its other peculiarities this Bat is rather related to those which we shall next have to describe, and thus forms a sort of transition between the two groups. It has the toes equal, and composed of only two phalanges, a character which distinguishes it from the preceding species; whilst its resemblance to them in the structure of the nose-leaf serves to separate it from its following allies. The teeth resemble those of *Rhinolophus*. In repose the tail and interfemoral membrane are generally turned back, which appears to be the case in some at all events of the following species. This species inhabits Northern Australia, and is especially abundant on the Coburg peninsula. It reposes during the day in hollow spouts and holes of the gum-trees.

THE DIADEM BAT.†

Whilst the *Rhinolophi* are chiefly inhabitants of elevated localities, especially in tropical regions, the members of the second large genus of Horseshoe Bats (*Phyllorhina*) for the most part frequent the plains and lower hills of the same countries. The most definite character separating the *Phyllorhinæ* from the *Rhinolophi* is the presence of only two phalanges (joints) in all the toes of the hind feet, the first toe in *Rhinolophus* having three such joints. The nose-leaf consists of a horseshoe and of two other portions, which, however, differ considerably in form from those of *Rhinolophus*; the anterior portion being horseshoe-shaped, but not notched in front, the intermediate part not forming a prominent process, but broad and heart-shaped, and the posterior part broad, erect, and concave in front. The number of teeth is the same as in *Rhinolophus*, except in one species (*P. tridens*), which has only a single pre-molar on each side in the upper jaw. Fourteen species of this genus are cited by Mr. Dobson as inhabiting the East Indies and the islands of the Eastern Archipelago, and one of them, the Diadem Bat (*Phyllorhina armigera*), which is found among the mountains of Northern India, extends its range as far north as Amoy in China. The characters of the nose-leaf in this species will be seen from the annexed figures, which show strikingly the great complexity of this curious apparatus. Behind the nose-leaf is the aperture of a peculiar sac situated in the forehead, which is characteristic of many species of the genus, and which can be turned out like the finger of a glove at the pleasure of the animal, and the surface of which secretes a waxy substance. Its centre bears a tuft of straight hairs, the tips of which project from the orifice when the sac is drawn in. The Diadem Bat is rather a large species, the head and body measuring from three and a half to four inches in length, and the expanse of the wings being about two feet. Its general colour is light brown, darker on the upper surface, where the hairs are ringed with three colours—pale sepia at the base, then grey, then dark sepia, with the extreme tips a little paler.



HEAD OF THE MALE AND FEMALE DIADEM BAT, ENLARGED. (*After Dobson.*)

* *Rhinonycteris aurantia.*

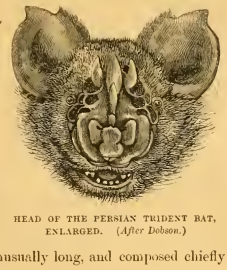
† *Phyllorhina armigera.*

The late Captain Hutton has given an account of the habits of this species as observed by him at Mussooree, where specimens were captured at elevations of 5,500 and 6,000 feet above the sea-level. At the latter elevation a pair resided in a loft, from which they issued every evening about dusk, and flew with a slow, deliberate flight round the house, from which they never departed to any great distance. They did not remain on the wing long at a time, but retired at intervals to their dwelling-place in the loft. The same writer describes these Bats, which seem to emerge from their concealment very early in the evening, as leisurely wheeling with noiseless flight round some wide-spreading oak, attracted by the loud discordant note of a large *Cicada*, which is abundant during the rainy season, and only pours forth its clamorous evening song just as the sun begins to dip below the horizon. "It is during this dreadfully harsh concert," he adds, "when almost every tree sends forth its stunning notes, that this Bat emerges from its hiding-place, wheeling round and round the trees, scanning each branch as he slowly passes by, now rising to a higher circle, and then descending towards the lower branches, until at length, detecting the unfortunate minstrel, it darts suddenly into the tree, and snatching the still screaming insect from its perch, bears it away."

In captivity, according to Captain Hutton, the large ears of this animal are kept in a constant, rapid, tremulous motion, and the creature emits a low purring sound, which is exchanged for a sharp squeak when it is alarmed or irritated. When it is suspended in a resting attitude the tail and interfemoral membrane are turned up, not in front, as usual in Bats, but behind, upon the lower part of the back. In this species and its allies Captain Hutton further noticed that when they are disturbed "the whole of the facial crests are kept in a state of constant agitation; and as the animal hangs suspended by the feet, the head and muzzle are stretched forth, and turned about in every direction, as if for the purpose of sniffing out the presence of danger, and ascertaining the cause of the disturbance."*

THE PERSIAN TRIDENT BAT.†

Under this name Mr. Dobson describes a very remarkable species of this family in which the nasal appendages seem to attain the extreme of complexity (see figure). The ears also are of very peculiar construction. This is a small species, about two and a quarter inches long, and of a pale buff colour, specimens of which were obtained at Shiraz in Persia at an elevation of about 4,750 feet above the sea. Its nearest ally, curiously enough, is to be found, according to Mr. Dobson, in the Australian Orange Bat (*Rhinonycteris aurantia*).



HEAD OF THE PERSIAN TRIDENT BAT, ENLARGED. (*After Dobson.*)

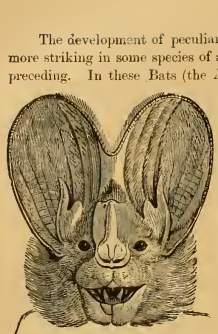
Frith's Short-tailed Bat (*Coelops Frithii*) is a still more remarkable species, single specimens of which have been obtained from the Sunderbunds and from Java. It is most nearly allied to the *Phyllorhinæ*, but has the horseshoe part of the nose-leaf composed of two notched pieces, the front lobes of which cover the base of two long hanging leaflets, the tail short, the interfemoral membrane deeply excavated, and the index finger unusually long, and composed chiefly of the metacarpal bone.

* Other common Eastern species are the Masked Leaf Bat (*Phyllorhina larvata*), which occurs in Bengal, Further India, Siam, and Java; the Bicolorous Leaf Bat (*P. bicolor*), which inhabits India, China, and many of the Eastern islands; and the Indian Horseshoe Bat (*P. speoris*), an abundant form in Central and Southern India and in Ceylon, and which has also been met with in Burmah. A single species (*P. taitiensis*) has been described from Tahiti. It is very nearly related to the last-named Indian form, if not merely a variety of it. A single species (*P. cervina*) also inhabits North Australia, where it has been met with at Cape York, and in sandstone caverns in Albany Island. It is about two inches long; above, tawny-brown, darker on the face, head, and shoulders; below, paler, with a grey tinge on the belly. Several species of the genus inhabit the warmer parts of Africa, and one of these (*P. tridens*), a small species, only two inches in length, an inhabitant of Egypt and Nubia, has the posterior nose-leaf divided into three teeth towards the forehead, a character which it displays in common with an Indian species (*P. Stoliczkana*), and another from Amboyna and Batchian, of still more diminutive proportions. A distinct genus (*Asellia*) has been proposed for the reception of these Bats. The largest species of the genus comes from Guinea and the Gold Coast, on the west coast of Africa. It is nearly five inches in length, and has received the name of *Phyllorhina gigas*. It is associated with two or three smaller species, and two or three others occur in Southern and Eastern Africa.

† *Triænops persicus.*

FAMILY III.—NYCTERIDÆ.

The development of peculiar nasal appendages for which the *Rhinolophidæ* are remarkable is still more striking in some species of another family, the members of which were formerly included in the preceding. In these Bats (the *Nycteridæ* of Mr. Dobson) the ears are enormously developed, membranous, and united either by a portion of their inner margins, or by a transverse band of membrane, the tragus or earlet is greatly developed, and the middle finger contains two phalanges.*



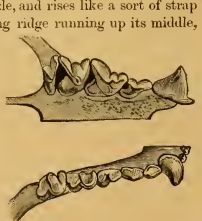
HEAD OF THE LYRE BAT.

The species inhabit the warmer parts of the Old World.

THE LYRE BAT.†

The extraordinary development of the ears and of the membranous appendages of the nose is greatest in the species of this genus, which has in consequence been denominated *Megaderma*, two of which inhabit tropical Asia, whilst two occur only in the warmer parts of Africa.

Of all the species the most abundant and best known is the Lyre Bat (*Megaderma lyra*, see figure), which is found with but little variation in its characters throughout continental India, from Cashmere to Cape Comorin, and also in the adjacent island of Ceylon. This extraordinary little creature, which measures only about three and a half inches in length, and is of a slaty blue colour, paler beneath, has its ears considerably longer than its head, and united for nearly half the length of their inner margins, and the earlets (*tragi*) very long, divided at the end into two parts, one of which, the posterior, is pointed, and a good deal longer than the other, which is rounded off at the end. The ears are, in fact, about half the length of the head and body. The nose-leaf starts from a nearly circular base, lying horizontally upon the muzzle, and rises like a sort of strap more than half an inch long, the front surface of which has a projecting ridge running up its middle, and corresponding to a deep groove on the posterior surface. The nostrils are situated in the concavity of the basal disc from which the nose-leaf springs. In this and the other species of *Megaderma* there are no incisor teeth in the upper jaw (see figure), the intermaxillary bone itself, which ought to bear these teeth, being represented only by a cartilaginous piece, which fills up the space between the canines; and the tail is exceedingly short, and contained in the basal part of the interfemoral membrane, which is large, and has its hinder margin concave, and not pointed as in most Bats.



TEETH OF THE LYRE BAT.

The great size of the ears and nasal appendages in these Bats has led Europeans in India to give them the name of Vampires, as they agree in these particulars with the true Vampire Bats of South America, and the name is certainly better applied to them than to the frugivorous Pteropidæ, which are sometimes called Vampires even by zoologists. It is, however, a singular fact that in both these groups the extraordinary developments of membrane about the head should be proved to co-exist with more bloodthirsty habits than are common to the Bats generally. It does not indeed appear to be absolutely made out that *Megaderma lyra* condescends to partake of that insect diet which contents so many of its fellows. As Mr. Dobson remarks, "The very peculiarly-shaped, elongated, narrow muzzle and large trenchant canines, with acutely-pointed basal cusps (see figure) of this and of the other species of *Megaderma*, the projecting mandible and divided lower lip, so different from all Insectivorous Bats, naturally lead us to suspect corresponding

* This character is of special importance here, as serving to distinguish the Megaderms from the species of another family of Leaf-nosed Bats belonging to the second principal group of Microchiroptera.

† *Megaderma lyra.*

differences in habits." And he goes on to say that in examining the stomach and intestines of numerous specimens of the present species, he always found them either perfectly empty or filled with a pultaceous matter, in which no remains of insects were to be recognised. Mr. Hodgson, however, found insects in the specimens examined by him. But whether it contemns insects or not, an observation made by the late Mr. Blyth suffices to prove that higher forms of animal life, and indeed its own near relations, are exposed to its attacks. The account given by Mr. Blyth is so interesting that, although rather long, we may give it entire :—

HEAD OF THE CORDATE LEAF BAT.

"Chancing one evening," he says, "to observe a rather large Bat enter an outhouse, from which there was no other egress than by its doorway, I was fortunate in being able to procure a light, and thus to proceed to the capture of the animal. Upon finding itself pursued, it took three or four turns round the apartment, when down dropped what at the moment I supposed to be its young, and which I deposited in my handkerchief. After a somewhat tedious chase, I then secured the object of my pursuit, which proved to be a fine female of *Megaderma lyra*. I then looked to the other Bat which I had picked up, and, to my considerable surprise, found it to be a small *Vespertilio*, nearly allied to the Pipistrelle of Europe, which is exceedingly abundant, not only here, but apparently throughout India. The individual now referred to was feeble from loss of blood, which it was evident the *Megaderma* had been sucking from a large and still bleeding wound under and behind the ear; and the very obviously suctorial form of the mouth of the Vampire was of itself sufficient to hint the strong probability of such being the case. During the very short time that elapsed before I entered the outhouse, it did not appear that the depredator had once alighted; and I am satisfied that it sucked the vital fluid from its victim as it flew, having probably seized it on the wing, and that it was seeking a quiet nook where it might devour the body at its leisure. I kept both animals separate till next morning, when, procuring a convenient cage, I first put in the *Megaderma;* and after observing it for some time, I placed the other Bat with it. No sooner was the latter perceived than the other fastened upon it with the ferocity of a Tiger, again seizing it behind the ear, and made several efforts to fly off with it; but finding it must needs stay within the precincts of its cage, it soon hung by the hind legs to the wires of its prison, and after sucking its victim till no more blood was left, commenced devouring it, and soon left nothing but the head and some portions of the limbs."

HEAD OF THE AFRICAN MEGADERM.

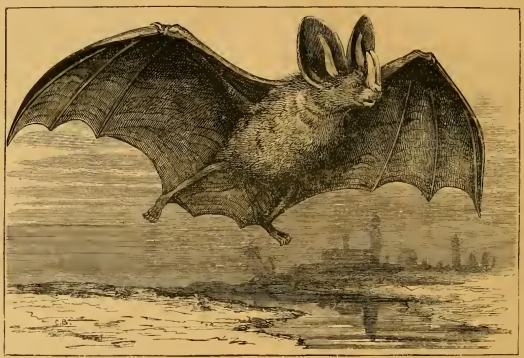
According to Mr. Jerdon, the Lyre Bat frequents old buildings, pagodas, roofs of houses, and caverns, and is very abundant in the innermost chambers of the cave temples of Ellora and Ajunta. The same writer states that it has been known to eat Frogs and fish; indeed, Mr. Blyth also charges it with a particular fondness for Frogs, and says that on quiet evenings the Bats may be distinctly heard crunching the skulls and smaller bones of their amphibious victims.*

The other Oriental species, the Cordate Leaf Bat (*Megaderma spasma*, see figure), very nearly resembles the preceding, both in colour and in general characters, but the posterior division of the earlet is larger and more acutely pointed, the nose-leaf, although similar, is shorter, and has the sides convex, and its conceave basal disc is considerably larger. This species is an inhabitant of the whole Malayan region, of Ceylon, Java, Sumatra, Borneo, Celebes, Ternate, and the Philippine Islands.

* See also some general remarks on the supposed carnivorous propensities of the *Rhinolophidæ*, p. 282.

THE AFRICAN MEGADERM.*

The best known African species (*Megaderma frons*) is an inhabitant of the west coast of that continent, where it is found in Senegal and Guinea. In this Bat the ears and nasal appendage (see p. 289) attain even a greater development than in *Megaderma lyra*; the earlet is very long, especially the posterior division of it; the ears are united by their inner margin for about half their length; and the fur is of an ashy colour, with a faint yellowish tinge. A second African *Megaderma* has been described by Professor Peters under the name of *Megaderma cor*; it is from Egypt, and somewhat



AFRICAN MEGADERM.

resembles *M. spasma* in the form of its nose-leaf, but in other respects is more nearly related to *M. frons*.

THE DESERT BAT.†

At the first glance, the Desert Bat would seem to have but little to do with the Megaderms, but its general organisation is very similar. The nose-leaf—the striking characteristic of the head in the Megaderms—is entirely wanting, unless indeed we may, with Professor Gervais, regard the groove which runs up the face from the nose to the forehead as really representing a sunken nose-leaf. This groove, or furrow, is a deep depression, increasing both in width and depth as it runs backwards, and is of such extent as to leave traces of its existence even on the underlying bones. In its posterior part the floor of the depression is divided lengthwise by a narrow ridge, and its sides are margined, as far back as the eyes, with peculiar horizontal cutaneous appendages. It is thus, evidently, a somewhat different manifestation of the tendency towards a peculiar development of the cutaneous system in the neighbourhood of the nose which we have seen to be characteristic of the Rhinolophidæ and Megaderms, and no doubt subserves the same purpose in the economy of the animal as the external nasal appendages of those Bats.

HEAD OF THE DESERT BAT.

The ears are large, and united across the forehead by a sort of membranous band; the tail is

* *Megaderma frons.* † *Nycteris thebaica.*

long, and contained within the interfemoral membrane; and the intermaxillary bones are present, and bear four incisor teeth. In the lower jaw there are six incisors. The canines, as in *Megaderma*, are large and powerful; there is a single pre-molar on each side in the upper, and two in the lower jaw, and the true molars are three on each side in both jaws.

These characters are common to all the species of the genus *Nycteris*, most of which are inhabitants of the continent of Africa. The Desert Bat (*N. thebaica*) is found in the desert regions of Egypt and Abyssinia, and receives its name from its occurrence in the Thebaid, that desert the caves of which gave shelter to so many hermits in early Christian times. It is a small Bat, the length of its head and body being about two and a half inches. Its ears are longer than the head,

DESERT BAT.

and the tail is about as long as the body, and enclosed within an ample interfemoral membrane, which is stretched on each side by a long heel-spur. The fur is of a grey colour.*

These Bats possess an exceedingly curious faculty, namely, the power of inflating the skin with air. The skin adheres to the body only at certain points, where it is connected by a loose areolar tissue, and the spaces thus left can be filled with air at the pleasure of the animal, through the large cheek-pouches, which have an opening at the bottom, and thus communicate with the spaces under the loose skin. When the animal chooses to inflate its skin it fills its lungs with air, and then, closing the mouth and nostrils, and contracting the chest, forces the air through the openings in the cheek-pouches under the skin. Its return is prevented by sphincter muscles, with which the above-mentioned apertures are provided, and also by large valves on the neck and back. By this means the Bat has the power of inflating its skin to such an extent as to resemble, according to Geoffroy, "a balloon with wings, a head, and feet attached to it." Geoffroy compares this condition of things with that of the fish of the genus *Tetraodon*, which also have the power of inflating their skins with air, but adds that

* Other described African species are *N. capensis* (Smith); *N. marrotis* (Dobson); *N. hispida* (Schreber); and *N. grandis* (Peters). The only species found out of Africa is the Javanese Desert Bat (*N. javanica*).

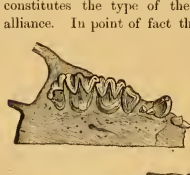
"more fortunate than the *Tetraodon*, which can only return to its original condition by becoming a mere inert mass on the surface of the water, the Bat preserves all its faculties, or, what is better, increases their energy by becoming lighter and capable of more rapidity in flight." This supposed advantage is at least questionable.

CHAPTER IV.

FAMILY IV.—VESPERTILIONIDÆ, OR TRUE BATS.

The Genus *Vespertilio* and the Family Vespertilionidæ—Characteristics: Nostrils—Tail—Ears—Dentition—Diet—Distribution—Long-eared Bat—Ears—Distribution—Asleep—In Captivity—Barbastelle—Characteristics—Distribution—Habits—Flight—In Captivity—Big-eared Bat—Townsend's Bat—The Genus *Nyctophilus*—Its true place—Characteristics—Geoffroy's Nyctophile—Pipistrelle—Distribution—Diet—Noctule—Natural Food—Mr. Daniell's Observations—Serotine—Parti-coloured Bat—Hairy-armed Bat—Negro Bat—Kuhl's Bat—Nilsson's Bat—Coromandel Bat—Thick-footed Bat—Temminck's Bat—Welwitsch's Bat—New Zealand Bat—Mouse-coloured Bat—Natterer's Bat—Daubenton's Bat—Whiskered Bat—Black and Orange Bat—Painted Bat—Harpy Bat—Red Bat—Schreibers' Bat—Brown Pig-Bat—Straw-coloured Bat.

Linnæus, in his "Systema Naturæ," united all the Bats known to him (with the exception of a single species, which, by a curious perversion of judgment he referred to a distinct genus, and placed in quite a different order) under the single genus *Vespertilio*. Later writers, finding it necessary, as their knowledge of these animals increased, to divide the Bats into many genera, have gradually, as it were, cut off portions of the old Linnæan genus and given them new names, always retaining the old name for the group which might be considered to include the most typical forms of the original genus *Vespertilio*, the ordinary Bats of European countries. Of these, only two are noticed in the last edition of the work of the great Swedish naturalist, and even these are now referred to two distinct genera, and the generic name of *Vespertilio* is now retained by only one of the few species with which Linnæus was acquainted. The genus, however, as at present restricted, contains a great number of species, all of which present the characters of what may be called an average Bat, forming, as it were, the centre (or part of the centre) round which the other groups forming the order may be ideally arranged, and hence it very appropriately bears the old name *Vespertilio*, as Bat *par excellence*, constitutes the type of the family Vespertilionidæ, and gives its name to the Vespertilionine alliance. In point of fact the genus *Vespertilio* and the family Vespertilionidæ may be regarded as the ideal centre of the whole order. As in other groups of the same kind the number of species contained in the family is very considerable, and their structural differences are generally minute, these, indeed, being the characteristics usually presented by what are called typical groups, the study of which is on this account attended with peculiar difficulties.



DENTITION OF THE THICK-LEGGED BAT.

Except in one Australian genus (*Nyctophilus*), which has been removed here from among the Megaderms by MM. Tomes and Dobson, the nostrils in the Vespertilionidæ are simple round or crescentic apertures placed at the extremity of the muzzle, and not surrounded by leaf-like appendages. The tail is always long, contained in the membrane between the legs, which it traverses from base to apex, usually leaving a single joint projecting beyond the membrane; the ears are of moderate or large size, are generally separate, and are furnished with large tragi. With regard to the teeth, the upper incisors are separated in the middle by a wide space and placed close to the canines. The number of incisor teeth in the upper jaw varies, being generally four, standing in pairs in the pre-maxillary bones, but in some species there is only one incisor on each side, and this difference may not be associated with any other characters sufficient to justify the generic separation of the species. The lower incisors are almost always six in number; one genus only has four. The canines are of moderate

BRITISH BATS AT HOME.

length and strength. The pre-molars again are exceedingly variable; there may be three or two on each side in both jaws, or one on each side in the upper and two in the lower jaw, but the occurrence of two above and three below is very rare. As a rule, when there are more than one pre-molar on each side in the upper jaw, the hindmost of them which is close to the true molars is larger than the one or two nearer the canine (see figure, p. 292), and the latter are often inserted within the line of the row of teeth. The true molars are three on each side in both jaws; they are well-developed, and show the characteristic sharp W-shaped cusps very distinctly.

The Vespertilionidæ are all, so far as is known, strictly insectivorous in their habits. They are found generally distributed throughout the temperate and warm regions of both hemispheres. It is to

LONG-EARED BATS IN FLIGHT.

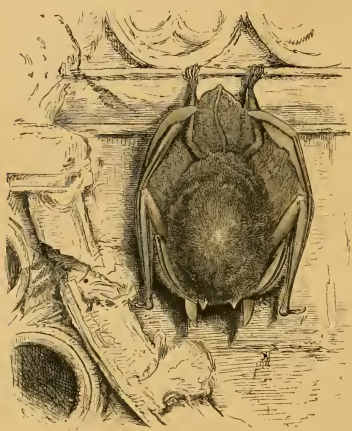
this family that nearly all the European Bats belong, and it includes all the British species, except the two Horseshoe Bats which have been already described.

THE LONG-EARED BAT.*

This common British species is known by the large size of the ears, which are united by their inner margins over the middle of the crown of the head. Hence this group, the *Plecoti* of authors, may be regarded as naturally forming a sort of stepping-stone from the Megaderms, with their extravagant dermal developments, to the more commonplace "Vespertiliones." In the Long-eared Bat this character is very striking, the ears being nearly seven-eighths as long as the head and body. The organs are quite thin and membranous, resembling those of the Megaderms already described, and they are traversed longitudinally by three thin threads of cartilage, which apparently serve by their elasticity to support the ears in an erect posture. From the middle thread of cartilage

* *Plecotus auritus.*

the inner margin of the ear is bent in, forming a sort of fold. A little above the base there is on each ear a small lobe, so placed that when the ears are erect these lobes touch each other. The outer margin of the ear ends opposite the base of the tragus, which is very long, tapering upwards. The tail, which is nearly as long as the head and body, is contained, all but the extremity of the last vertebra, in the ample interfemoral membrane, along the posterior margin of which the spurs extend fully half-way from the heel to the tip of the tail on each side. The fur in the Long-eared Bat is long, thick, and soft; the hairs are blackish at base, tipped above with brown, with a reddish or greyish tinge, which appears to vary with the age of the individuals, and beneath with pale brownish-grey. All the membranes are dusky, usually with a reddish or brownish tinge. The head and body in this species measure about one inch and five-sixths in length, and the tail is about one-sixth of an inch shorter. Its expanse of wing is ten inches.



LONG-EARED BAT SLEEPING.

This Bat occurs in nearly all parts of Europe and in North Africa, extending eastwards throughout Central Asia, but apparently not south of the Himalayas. Specimens from Northern Africa, even up to the fifth Cataract of the Nile, and from the desert regions about the Mediterranean and Caspian Seas, are described as having the fur paler and more ashy in colour, and the membranes also paler than those from more humid localities.

The Long-eared Bat is common, and pretty generally distributed in Britain, but is not so abundant or so well known as some other species. This may, perhaps, be in part due to the fact that it is a nocturnal species, coming abroad later than its fellows, and continuing on the wing in pursuit of the moths, which appear to constitute its chief prey, during the whole of the night. "At all hours," says Mr. Bell, "through the dead of the night, and in the darkest nights, in the open fields or elsewhere, we have heard the shrill chatter of the Long-eared Bat over our heads, its voice, once known, being easily recognised from that of any other species." Mr. Bell suggests, what may probably be true, that the great development of the ears in this (and probably other species) may be connected with the habit of flying late at night. It chiefly frequents the open country, taking up its abode in the roofs of tiled houses, especially in country villages, in which situations the Bats pass the day during the summer, suspended in clusters from the walls and timbers by the claws of their hind feet, and the whole winter cosily packed between the tiles and in various holes and corners. It also exhibits a predilection for church towers. When sleeping, the long delicate ears are not generally left exposed, but are folded down under the wings, where they are carefully tucked away. This is commonly the case when the Bat has settled down for its day's sleep, and always occurs during hibernation. When the ears are thus disposed of, the earlets or tragi still project from the head, giving the little creature the appearance of possessing only a pair of short pointed ears (see figure).

In captivity the Long-eared Bat soon becomes very tame and familiar. These Bats will fly about the room, play with each other, and may soon be induced to feed from the hand. "One kept by Mr. James Sowerby," as stated by Mr. Bell, "when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly towards it, and, pitching on the hand, take the fly without hesitation. If the insect was held between the lips, the Bat would then settle on its young

patron's cheek, and take the fly with great gentleness from the mouth; and so far was this familiarity carried, that when either of the young people made a humming noise with the mouth, in imitation of an insect, the Bat would search about the lips for the promised dainty." From an observation made by Mr. Tomes (Bell's "British Quadrupeds," second edition, p. 76), it would appear that the Long-eared Bat, even in freedom, habitually captures at least some of its food in a somewhat similar manner. He says that "having occasion to rise early—about three in the morning—on opening the window of his bedroom, a Bat of this species was seen actively engaged around the sprigs of a spindle-tree which extended across the window. It was in bloom at the time, and was surrounded by a cloud of Microlepidoptera, on which the Bat was feeding. As this took place scarcely four feet from the open window it was easy to see the whole proceeding, and to determine with certainty the manner in which the food was taken. With scarcely an exception, the moths were picked from the leaves while resting there, only one or two being taken on the wing. While thus occupied the Bat hovered much after the manner of the Kestrel, and the ears were bent outwards so much as to curl down the sides of the face, appearing more like two large cheek-pouches than ears, no part of them appearing of greater elevation than the crown of the head."

On the ground the progression of the Long-eared Bat is very peculiar. Bats in general run along the ground with the head and body in a nearly horizontal position, but the Long-eared Bat carries the fore part of its body raised, and advances by a series of jerks, first on one side and then on the other.

Several species nearly related to the Long-eared Bat have been described under various generic names. *Antrozous pallidus* is an inhabitant of North America, *Histiotus velatus* is found in Brazil, and *Otonycteris Hemprichii* occurs in Nubia.

THE BARBASTELLE.*

The Barbastelle is another British Bat belonging to the same group of the family Vespertilionidæ as the Long-eared Bat, but forming the type of a very distinct genus. The ears, instead of being elongated into great membranous organs half as long as the body of the animal, are only of moderate size, but they are united by their inner margins in the middle of the forehead a little in front of the eyes. The outer margin sweeps round upon the face, on which it terminates above the upper lip, so that the eye is almost completely surrounded by the ear. The tragus is triangular and pointed. The nostrils, as in *Plecotus*, open on the upper surface of the nose in front of a naked space, and from each nostril a deep groove runs down to the edge of the upper lip. The muzzle is short and blunt, giving the animal rather a surly aspect; the tail is nearly as long as the body, and enclosed in the interfemoral membrane, except the extreme tip; and the teeth are as in the Long-eared Bat.

HEAD OF BARBASTELLE.

The Barbastelle is by no means a common Bat in England, where it seems to be confined to the Southern and Midland Counties, extending as far north as Northamptonshire and Warwickshire. It is found in France, rarely in Belgium and Germany, in Italy, Scandinavia, and Russia. In the southern part of the last-mentioned country it appears to be more abundant than elsewhere, especially in the Crimea, on the south coast of which it is said by M. Demidoff to be very common. It is said by Mr. Bell to occur in Nepaul, but the specimens referred to by him probably belong to the Darjeling Bat (*Synotus darjelinensis*) of Mr. Hodgson.

This curious little Bat measures about two inches in length of body, and its tail is about a quarter of an inch shorter. The expanse of its wings is ten inches. The cheeks are covered with black hair, which forms a sort of moustache. The ears are irregular in form, their tips being slightly truncated, and their outer margins sweeping in so as to form a notch, from which five or six folds run about half-way across the ear. The eyes are almost concealed by the black hairs on the cheeks. The

* *Synotus barbastellus.*

fur is long and soft, and of a brownish-black colour, with whitish tips, which are longer on the hairs of the lower surface. The membranes are dusky black.

In its habits the Barbastelle seems to be rather solitary; both in its places of repose and in its evening flights it is generally seen alone. It sometimes takes up its abode in caverns, but almost any place of retreat will suit it. Thus it may be found in the crevices of walls or trees, in the roofs of sheds, behind shutters, and in fact in almost any situation that offers it a chance of concealment. Its flight is peculiar, being a lazy, desultory sort of flutter, performed as if with no particular object; and according to Mr. Bell it is in the habit of approaching evening promenaders "so closely that the flutter of its wings may be heard, and even the cool air thrown by their movement felt upon the cheek." In captivity the Barbastelle is rather timid, and does not become familiar with its keeper after the fashion of its near relation, the Long-eared Bat; and when confined with other Bats it shows a certain sullenness of disposition, and an inclination to keep apart from its companions. A specimen received in winter by Mr. Bell from a chalk cavern at Chislehurst was very restless when awake, and was constantly biting at the wires of his box, as if endeavouring to escape. "When suffered to fly about the room, he flew very low, and less actively than any other under similar circumstances; and he was fond of lying before the fire on the hearthrug, where he appeared quite to luxuriate in the warmth."

EAR AND HEAD OF TOWNSEND'S BAT. (*After Allen.*)

In the second edition of "Bell's British Quadrupeds," a beautiful variety of this Bat from Alcester, in Warwickshire, is mentioned, having "the fur of the under parts, from root to tip, strongly tinged with purplish-red, or rose-colour." The authors also state that they have seen a perfectly white specimen of the species, and one in which the head and neck were of the ordinary dark colour, whilst the rest of the body was pure white. In both these specimens, which were young, the membranes were nearly white.

THE BIG-EARED BAT.*

Two North American Bats, allied to the Long-eared Bat and the Barbastelle, have been formed into a distinct genus by Dr. Allen. They have the ears very large, with the outer border carried forward beneath the tragus, which is nearly half as long as the ear, tapering upwards, and furnished near the base on the outer side with a small circular lobe standing almost at right angles to the tragus. The sides of the nose bear large excrescences, which join with the inner margins of the ears. There are three pre-molars in the lower jaw, instead of two, as in *Plecotus* and *Synotus*.

The Big-eared Bat is a small species an inch and four-fifths long, with a tail nearly of equal length. It is clothed with a long, fine, and soft fur, the hairs of which are blackish at the base, with dusky-brown tips on the upper surface, and greyish tips below. This Bat is an inhabitant of the Southern Atlantic States of the Union.

Townsend's Bat (*Corynorhinus Townsendi*) is a very similar animal, but is a little longer, and has the face larger and broader and the facial crests more prominent. Its ear and head are shown in the annexed figures. The fur is brown above, with the bases of the hairs only a little darker than the tips, lighter beneath, and slightly rusty towards the base. It inhabits the central parts of the United States (Missouri, Utah).

GEOFFROY'S NYCTOPHILE.†

The genus *Nyctophilus* includes a small number of Bats belonging to the Australian region, which, on account of their possession of a rudimentary nasal appendage, have usually been placed with

* *Corynorhinus macrotis.* † *Nyctophilus Geoffroyi.*

the *Megaderms* or the *Rhinolophidæ*. But apart from the presence of the nose-leaf, which is of very simple structure, the characters of these Bats are in such close agreement with those of the Vespertilionidæ, that there seems to be no doubt that this is their true position. They appear to be most nearly related to *Plecotus*.

The nasal appendages are very simple, consisting of a transverse front piece placed immediately above the nostrils, and having its upper margin straight, and a second portion, also transverse, placed at a greater distance from the first than the latter from the nostrils, and thickly clothed with short bristly hairs. The ears are large, ovoid, united at their bases by a membrane which runs across the top of the head, and furnished with a short broad tragus. The dentition differs from that of the allied genera. There are two separated incisors and only one pre-molar on each side in the

GEOFFROY'S NYCTOPHILE. (*From Gould's "Mammals of Australia."*)

upper jaw, and the lower jaw has only two pre-molars on each side. Thus the dental formula is—incisors, $\frac{1-1}{6}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{1-1}{2-2}$, molars, $\frac{3-3}{3-3}$.

Geoffroy's Nyctophile, which appears to be one of the commonest species, as also the one first described, is a small Bat, the head and body measuring rather more than two inches in length, and the tail more than one inch. The heel-spurs are half an inch long. The body is covered with long, thick, and soft fur, which is usually brown above and brownish-grey beneath, the hairs on both surfaces being black at the base, tipped above with olive-brown, and on the under surface with brownish-white. The membranes are dark brown. The species is an inhabitant of Western Australia, where it is abundant. These Bats are sometimes found in great numbers in the hollow spouts of the gum-trees, from which they emerge in the evening to flit about the shrubs and smaller trees in search of insects.

Three other species of this genus are known, one of which, although originally described as from Timor, and named *N. timoriensis*, is only known to occur in Western Australia; another is from New South Wales, and the third from Van Diemen's Land.

THE PIPISTRELLE.*

The commonest and most generally distributed of the British species is the Pipistrelle,† to which the local country name of Flittermouse is considered by Mr. Bell to be specially applicable. In this and the allied species forming the genus *Vesperugo*, the outer margin of the ear sweeps round on the cheek below the tragus, so as nearly to reach the angle of the mouth, and there is a small membranous lobe outside of the spur which runs from each heel into the interfemoral membrane. There are four incisor teeth in the upper and six in the lower jaw.

The Pipistrelle is of a reddish-brown colour above, paler beneath. The ears are about two-thirds

PIPISTRELLE IN FLIGHT.

of the length of the head, somewhat triangular, rounded at the tips, with the upper part of the outer margin deeply concave; the earlet, or tragus, is nearly half as long as the ear, and is of an oblong form with the apex rounded; the wings extend down to the base of the toes, and their membrane, like that of the ears, is of a dusky tint.

This Bat seems to occur abundantly in all parts of the British islands. It is also common on the continent of Europe, as far north as the central parts of Sweden, and southwards to the shores of the Mediterranean, extending thence eastwards through Russia into Siberia and Central Asia, but not passing to the south of the Himalayas. It is essentially an inhabitant of temperate regions. Its favourite resting-places in Britain, according to Mr. Jenyns, are the crevices of decayed brick walls, the cracks of old door-frames, and behind the pipes which are attached to buildings for carrying off rain-water; and Mr. Bell describes it as taking shelter under the roofs of houses, and in crevices of buildings of every description, either inside or out. According to the second edition of Mr. Bell's work, a specimen

* *Vesperugo pipistrellus.* † A name derived from the Italian equivalent of the word "Bat."

has been taken from a hole in the thatch of a low shed in a brick-field, another from a pile of hurdles in a stackyard, whilst a third was observed issuing from the spout of a disused wooden pump, and one was captured from behind a piece of loose bark on a pollard willow near Stratford-on-Avon.* The Pipistrelle is thus rather indiscriminate in its choice of a residence, and this may perhaps be due to the fact that its period of winter torpidity is shorter than that of any other species found in the countries which it frequents. In Great Britain it appears on the wing as early as the middle of March, and does not retire for its annual sleep until the winter season has decidedly set in; indeed, Mr. Gould once shot a specimen in the middle of a bright sunny day just before Christmas. Its food consists principally of small insects, especially Gnats, Midges, and other small two-winged flies, but it does not confine itself exclusively to such diet; raw meat possesses such attractions for it that this Bat not unfrequently makes its way into places where this is kept, and may be found clinging to a joint, and making a hearty meal upon it. In confinement, also, the Pipistrelle readily takes small pieces of raw meat as a substitute for its ordinary insect food, and it will become so tame as to take its nourishment from the fingers. On the ground the Pipistrelle runs with considerable ease and quickness, and Mr. Bell states, in opposition to the assertions of certain writers, that it can rise from a flat surface without difficulty. He says:—"We have often seen the Pipistrelle rise from a plane surface with a sort of spring, instantly expand its wings, and take flight. This was repeated by a single individual several times in the course of an hour, and without the slightest appearance of difficulty or effort; it was, on the contrary, evidently a natural and usual action." The same writer remarks that this Bat climbs with considerable agility, and in connection with this notices a peculiarity in the use of the tail which appears to have escaped other observers, namely, that it is used as an organ of prehension. The last joint of the tail projects a little beyond the interfemoral membrane, and "not only does the animal employ the tail in horizontal progression, in which case it assists in throwing forward the body, by being brought into contact with the ground on either side alternately, corresponding with the action of the hinder foot on the same side; but in ascending and descending a rough perpendicular surface, this little caudal finger holds by any projecting point, and affords an evident support. This is particularly conspicuous when the Bat is traversing the wires of a cage, in which situation the fact was first observed."

THE NOCTULE.†

The Great Bat, or Noctule, is another well-known British species, although far from being so abundant as the preceding. It is, however, even more widely distributed, being found in nearly all parts of the Eastern hemisphere, except the extreme north, but in tropical regions, according to Mr. Dobson, it seems to inhabit only the high grounds. In England it ranges as far north as Yorkshire. Its head and body measure about three inches in length, and its wings are about fourteen inches in expanse. Its fur is of a reddish-brown colour, nearly uniform throughout; the ears are ovate-triangular, shorter than the head, broad, and having the outer margin produced down upon the cheek below the level of the angle of the mouth; the earlet is short, not more than one-third the length of the ear, broad, with the outer margin rounded and the inner one concave. The wing-membranes reach only to the ankle-joint, and there is a distinct lobe outside each of the spurs.

HEAD OF NOCTULE.

The Noctule seems to prefer for its resting-place the hollows of old trees, and generally to avoid buildings, although instances of its taking up its abode in or about the latter are not wanting. It is

* Mr. R. McLachlan, F.R.S., mentioned to the present writer an instance which fell within his own experience of the dislodgment of a Bat from beneath a large piece of bark which was torn from a tree by an entomologist in search of Beetles or larvæ. When the bark was detached, the Bat fell, but the entomologist, being unprepared probably for such large game, omitted to secure it, and the species was not ascertained.

† *Vesperugo noctula.*

gregarious in its habits, considerable numbers often retiring together to the same hiding-place. Thus, in the second edition of Bell's "British Quadrupeds," a good many Noctules are said to have been "dislodged from a hole made by the Green Woodpecker in an elm by the insertion of a flexible stick;" and at Rugby, in Warwickshire, in a grove of old oaks, their excrement has been observed to form so thick a layer as to darken the ground under some of the oldest trees. Pennant states, on the authority of Dr. Buckworth (Buckhouse?), that one hundred and eighty-five of these Bats were taken in one night from under the eaves of Queen's College, Cambridge, followed by sixty-three on the second night, when the supply seems to have been nearly exhausted, as only two were captured on the ensuing evening.

The natural food of the Noctule consists of insects, and its jaws are sufficiently powerful to enable it to devour even such large and horny Beetles as Cockchafers, which, indeed, seem to constitute its favourite food. It is, in fact, most active during the period of the year when these insects abound, for White, who first noticed its occurrence in Britain, states that he never saw it at Selborne before the end of April, or later than the end of July. In Warwickshire, however, it has been observed as early as the 12th of March, and as late as the 18th of September. It flies very high, and on this account was named by White *Vespertilio altivolans*. Its course through the air is rapid and straight, and accompanied by a continual sharp and shrill cry, which ceases only during the capture and consumption of its insect prey. It is described by White as emitting a rancid and offensive odour.

Mr. George Daniell, in a paper communicated to the Zoological Society in 1834, published some notes on the behaviour of this Bat in captivity, which are particularly interesting from the description they contain of the birth of a young Noctule. Mr. Daniell obtained four females and one male of this species on the 16th of May, 1834. The male was very savage, biting the females, and breaking his teeth upon the wires of the cage in his attempts to escape. He refused to feed, and died on the 18th of May. The females, although at first sulky, fed after a time upon small pieces of raw beef, which they seemed to prefer to insect food. One of them died on the 20th, and two others on the 22nd; the survivor, which fed by preference upon the breasts and livers of fowls, lived on for rather more than a month. It passed the day suspended by the hind feet at the top of the cage, and came down in the evening to feed, which it did sometimes most voraciously; the quantity eaten exceeding half an ounce, although the weight of the animal itself was only two drachms. It rejected flies, but ate parts of some Cockchafers that were given to it. The animal was rather careful in cleaning itself, using the posterior extremities as combs, with which the hairs were parted on either side from head to tail, forming a straight line down the middle of the back. The membrane of the wing was cleaned by passing the nose through its folds. On the 23rd of June Mr. Daniell observed his Bat to be very restless, and this condition lasted for about an hour, the animal remaining as usual suspended by the hinder extremities. Suddenly "she reversed her position, and attached herself by her anterior limbs to a cross wire of the cage, stretching her hind limbs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane, so as to form a perfect nest-like cavity for the reception of the young, ... which was born on its back, perfectly destitute of hair, and blind. The mother then cleaned it, turning it over in its nest; and afterwards, resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suckling. At the time of its birth the young was larger than a new-born Mouse; and its hind legs and claws were remarkably strong and serviceable, enabling it not only to cling to its dam, but also to the deal sides of the cage. On the 24th the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her usual position was reversed. In the evening she was found dead; but the young was still alive, and attached to the nipple, from which it was with some difficulty removed. It took milk from a sponge, was kept carefully wrapped up in flannel, and survived eight days; at the end of which period its eyes were not opened, and it had acquired very little hair."

From these observations of Mr. Daniell it appears that the period of gestation in the Noctule exceeds thirty-eight days, and they are of very considerable interest with respect to the general history of the Chiroptera, at any rate of the present family, for it is most probable that the conduct of this female Noctule on this interesting occasion is closely followed by other maternal Vespertilionidæ at the arrival of their "little strangers." Moreover, the fact of the production of only a single young

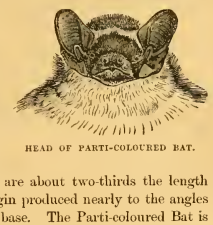
one, and the finding of only a single embryo in each of the three females which died soon after they came into Mr. Daniell's possession, taken in conjunction with observations to the same effect which have been made upon the female of the Pipistrelle, and of several other species of Bats, would seem to show that the Bats in general produce only one at a birth.

THE SEROTINE.*

Three other species of *Vesperugo* occur in Britain. One of these, the Serotine (*V. serotinus*), is nearly as large as the Noctule, and closely resembles that species in some respects in its habits. The head and body in the Serotine are about two inches and two-thirds in length; the ears are ovate-triangular, and a little shorter than the head; the tragus is a little more than one-third the length of the ear; and the extremity of the tail projects nearly a quarter of an inch from the membrane. The fur, which is soft and silky, is usually chestnut-brown above, and yellowish-grey beneath, but it is liable to vary more or less; British specimens being sometimes of a greyish tinge, whilst some from the Asiatic side of the Ural Mountains are described as having the upper parts yellowish cream-colour, and the lower surface yellowish-white. Like the preceding species, the Serotine is widely distributed, being found apparently over a great part of Europe, and throughout the temperate regions of Asia, at least as far east as the Himalayas; whilst specimens have been identified with it, which were brought from the northern parts of Africa, as far south as the mountains near the Gaboon. In England it is found only in the South-eastern counties, and is said to occur in the neighbourhood of London. Folkestone and the Isle of Wight are other recorded localities. In France it is not uncommon, frequenting the forests, and flying amongst the lofty trees; it is also found in the timber yards of Paris. Like the Noctule it is late in making its appearance in the spring, and it also flies late at night, whence its specific name. In France it bears one young one about the end of May.

THE PARTI-COLOURED BAT.†

Of the Parti-coloured Bat (*Vesperugo discolor*) only a single specimen has been taken in England, and it was obtained by Dr. Leach many years ago at Plymouth. The probability is, as indicated by Mr. Bell, that this individual must have been conveyed to Plymouth in the rigging of some vessel. On the continent of Europe it is found chiefly in Russia and Germany, but does not extend into Belgium, Holland, and France. It has also been obtained from Central Asia and from the Himalayas. This Bat is of the same size as the Serotine, and is perhaps the handsomest of the European species, the fur of the upper surface being of a fine chestnut or deep brown colour, with the extreme tips of the hairs pale, or even sometimes white, giving the fur a finely-marbled appearance, while that of the lower parts is grey at the base and white at the tips, with a reddish-brown patch on the middle of the chest and belly. The ears are about two-thirds the length of the head, oval, and directed outwards (see figure), their outer margin produced nearly to the angles of the mouth, and their inner margin with a projecting lobe at the base. The Parti-coloured Bat is said to haunt towns, and to come abroad early in the evening.



HEAD OF PARTI-COLOURED BAT.

The Hairy-armed Bat (*Vesperugo Leisleri*) also for a long time founded its claim to be regarded as a British species upon a single specimen, but of late years it has occurred at several localities in the midland counties of England and in Ireland. It is a little smaller than the preceding species, the head and body measuring only two inches and a half in length, and is characterised especially by having a broad band of hair upon the wing-membrane along the whole course of the fore-arm. The fur is bright chestnut above and brownish-grey on the under surface. It is found generally about villages, and appears to take up its residence in buildings. On the continent it seems to be pretty generally distributed, and it extends, like the preceding species, over the temperate parts of Asia. Specimens have also been brought from the Azores and Madeira, and it is believed to live in Algeria.

* *Vesperugo serotinus.* † *Vesperugo discolor.*

Several other species of this genus have an almost equally wide range. Thus one that may be called the Negro Bat (*Vesperugo maurus*) is found along the whole of the great axis of elevation of the Old World from the Pyrenees into China, and even extends southwards into India, Cochin China, and Java. This species has a sooty-brown or deep-black fur, with the tips of the hairs greyish. Kuhl's Bat (*Vesperugo Kuhlii*) is found throughout India, and in Persia and Southern Europe, to Madeira. It is rather a small species, about an inch and three-quarters long, with black fur, tipped for one-fourth of its length above with yellowish-brown or dun-colour, and beneath with ash-colour. Another species, Nilsson's Bat (*Vesperugo borealis*), which has the highest northern range of any species of the order, stretches right across the old continent, from Scandinavia and Germany as far south as the Hartz Mountains, to the Altai Mountains and North China. This species has a dark-brown fur, tipped with yellowish-brown above and with ash-colour beneath. It is about two inches long.

THE COROMANDEL BAT.*

Besides the preceding, which are common to Europe, there are a good many purely Asiatic species, mostly belonging to the Indian region and its islands. Mr. Dobson enumerates eighteen such species, the most generally distributed of which is the Coromandel Bat (*Vesperugo abramus*), which appears to represent in the southern parts of Asia the Pipistrelle of the more temperate regions. It is rather larger than the Pipistrelle, measuring an inch and three-quarters in length, and the outer margin of the ears is straight, or very slightly concave; the fur is dark-brown, tipped with light yellowish-brown above, and sooty-brown with pale tips beneath, and the head, face, and neck are yellowish-brown. This species is common in India and Ceylon, and extends thence through China to Japan, occurring also in several islands of the Eastern Archipelago.

Mr. Swinhoe says that it is a common house Bat at Nagasaki, in Japan. He also found it abundantly in Hainan, and, treating it as the common Chinese Bat, quotes the description of the Bat from the Chinese *Gazetteer*, in which, as is usual with Chinese writers, the animal is classed with birds. This choice description is as follows:—"Peenfoo, or Bat, shaped like a Mouse, has thin flesh-wings uniting the four legs, and extending to the tail. In winter stows away; in summer comes out. In daytime lies prostrate; in night flies. One name for it is Foo-yeh, or Belly-wings. It is now called Feishoo, or Flying Mouse."

THE THICK-FOOTED BAT.†

In this species, which inhabits Northern India, Tenasserim, the Andaman and Philippine Islands, and the Islands of Java and Sumatra, the bases of the thumbs and the soles of the feet are furnished with broad, fleshy pads, which on the feet form nearly circular discs, and are doubtless organs of adhesion, analogous to the more perfect sucking discs present in an American member of the family (*Thyroptera tricolor*). These organs probably assist the Bat in clinging to the under surfaces of large leaves and fruit, a habit which is common to many tropical species of Bats. It is remarkable that in this species, as in the *Thyroptera*, the claws on both the thumbs and the toes, although acute, are very small.

The Thick-footed Bat is about an inch and three-quarters in length of body, with a tail an inch and a quarter long. It is covered with a fine, dense, and moderately long fur, of a bright reddish-brown colour above, paler beneath. There is only one pre-molar on each side in the upper and two in the lower jaw, and this character, with the presence of the foot-pads, serves to distinguish the sub-genus *Tylonycteris* of Professor Peters, to which this species belongs.‡

TEMMINCK'S BAT.§

A few species, very nearly allied to the preceding, form the genus *Scotophilus*, in which the outer margin of the ear likewise comes down to the level of the angle of the mouth, but there are only two

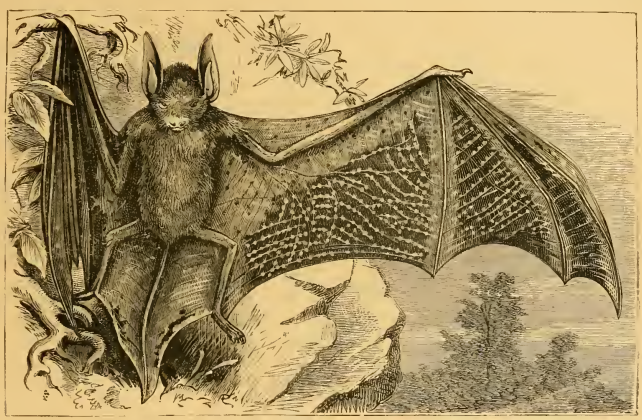
* *Vesperugo abramus.* † *Vesperugo pachypus.*

‡ Another Eastern species, furnished with pads on the thumbs and feet, is the Club-footed Bat (*V. tylopus*), from Northern Borneo, which is distinguished from the above by the presence of two pre-molars on each side in the upper jaw. A small African species, the Dwarf Club-footed Bat (*V. nanus*), is similarly provided.

§ *Scotophilus Temminckii.*

incisor teeth in the upper jaw, instead of four as in *Vespertugo*. These are stout-bodied Bats, with the muzzle nearly naked, the limbs strong, and the wing-membranes very thick and leathery, and scarcely encroached upon by hair. They are confined to the Eastern Hemisphere, and generally to its warmer parts, the species being found in Africa, Southern Asia and its islands, and in Australia. The best-known species is Temminck's Bat (*Scotophilus Temminckii*), which enjoys a wide range from India and Ceylon eastward through Burmah and Southern China to the Eastern Archipelago, extending to the Moluccas and Philippine Islands. It is rather more than three inches in length, and varies considerably in colour, but is generally dark olive-brown above, and reddish or yellowish-white beneath. The fur, as throughout the genus, is short and close. The ear is peculiar in its form, and its outer margin sweeps round on the cheek and terminates in a convex lobe; the tragus is narrow

HEAD OF TEMMINCK'S BAT. (*After Dobson.*)



WELWITSCH'S BAT. (*Half natural size.* From the *Proceedings of the Zoological Society.*)

and pointed, and considerably curved forwards and inwards. Temminck's Bat is very abundant in the countries which it inhabits, and is one of the most prominent species of the group, seeing that it lives in large bands, often of several hundred individuals, in the roofs of houses and in hollow trees, and that it flies very early in the evening, in fact before the commencement of twilight. Temminck says that it feeds principally on White Ants (*Termites*).

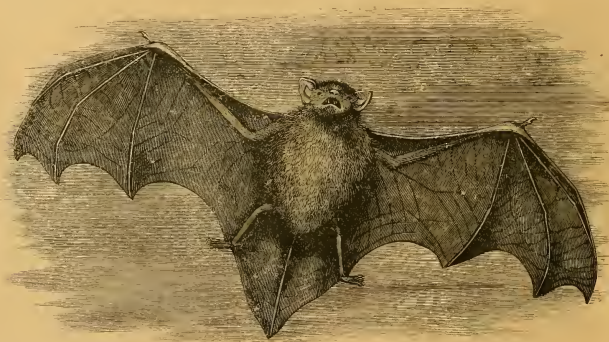
The Harlequin Bat (*Scotophilus ornatus*), another Indian species, is remarkable for its coloration, which is a pale tawny-brown, curiously variegated with white spots. It has been obtained in India, Burmah, and Yunnan.

WELWITSCH'S BAT.*

This curious Bat, originally described by Dr. Gray from a specimen sent from Angola by the late Dr. Welwitsch, is especially remarkable for the brightness and variegation of its colours. The general tint of the fur is brown, the hairs being black at the base, with brown tips, which are longer and paler on the hairs of the lower surface, rendering the fur of that part paler than that of the back.

* *Scotophilus Welwitschii.*

The head also is pale, and the muzzle shows an orange tint, as do the ears, which are longer than the head, and rather acute, with a long pointed tragus, reaching nearly half-way up the ear. But the most striking peculiarity of the species consists in the colouring of the wings, which are yellowish-brown, dotted with black near the body, and beyond this chiefly blackish-brown, with numerous yellow dots arranged more or less regularly in curved lines, while a broad band of brownish-orange, bearing a few black dots, follows the course of the fore-arm, and gives origin at the wrist to three other bands of the same colour, one running down the margin of the wing and enclosing the first and second fingers, the other two following the course of the third and fourth fingers, and thus breaking the dark ground colour of the wing into three triangular patches. The occurrence of this peculiar mode of coloration in a Bat is the more remarkable as it is reproduced in at least two quite distinct species, namely, the Oriental *Vespertilio formosus* and *Kerivoula picta*, and in all these must probably subserve the same purpose, which Mr. Dobson with much justice supposes to be the protection of the animal by assimilating its appearance to that of withered leaves. The arms and legs in Welwitsch's Bat are yellow,



NEW ZEALAND BAT. (*Half natural size.* From the *Proceedings of the Zoological Society.*)

but the feet are black. The interfemoral membrane is yellowish-brown, with a few black dots, especially towards its margins. The length of the head and body is about three inches. Of the habits of this Bat nothing is recorded.

THE NEW ZEALAND BAT.*

Two species of Bats have been ascertained to inhabit New Zealand, and both present characters which isolate them systematically, just as much as their distant insular habitation does absolutely. The present species was discovered by J. R. Forster, the naturalist who accompanied Captain Cook, and described by him under the name of *Vespertilio tuberculatus*. It has short rounded ears; there are cutaneous lobes at the angles of the mouth, and three true molars on each side in both jaws. The upper incisors are in pairs, the inner ones much larger than the outer, and are separated from the canines; the pre-molars are small and pointed, and the molars of the ordinary form in the allied genera. The tragus is short, rather broad, and rounded at the tip. The wing-membranes spring from the base of the toes; the interfemoral membrane is large, and contains the long tail, of which the tip only projects; and the heel-spurs are long, extending one-third of the distance between the heel and the tip of the tail.

* *Chalinolobus tuberculatus.*

In its form and general proportions this Bat resembles the common British Pipistrelle, as also in the characters of the skull. In its dentition it has a still closer affinity to an Australian species, Gould's Bat (*Scotophilus Gouldii*). The fur is of a blackish-brown colour on the head and back, becoming chestnut-brown on the rump; the lower surface is of a similar colour, but browner, and becomes reddish-brown towards the tail. The hairs are of one colour throughout their length. The length of the head and body is rather more than two inches, and that of the tail about an inch and a half. This Bat inhabits the middle island of New Zealand. Nothing appears to be known of its habits.

THE MOUSE-COLOURED BAT.*

The genus *Vespertilio*, as now restricted, comprehends a very considerable number of species distributed in nearly all parts of the world. It differs from *Vesperugo* in having the outer margin of the ear terminated opposite the level of the tragus, and not produced towards the angle of the mouth, and is further characterised by the nostrils being simple and crescent-shaped, and scarcely projecting from the muzzle. Eight species inhabit Europe, and five of these are found in Britain.

The Common Bat of the continent of Europe, the Mouse-coloured Bat of Prof. Bell (*Vespertilio murinus*), is a large species more than three inches and a half in length. Its fur is of a pale reddish-brown colour above and greyish-white beneath, but with the bases of all the hairs black; the head is long, the ears oval, narrowed towards the apex, as long as the head, and the tragus is nearly half as long as the ear, narrow, pointed, with its inner margin quite straight. The membranes are of a yellowish-brown colour. *Vespertilio murinus* is met with in the north-western Himalayas, and extends thence through Syria into Northern Africa. It is common in Central and Southern Europe, but in England is one of the rarest Bats; in fact the only known British-caught specimen was taken (most conveniently) in the gardens of the old British Museum. Its claim to be considered indigenous rests, therefore, upon a very insecure foundation. In many parts of Europe, however, this species is exceedingly abundant, and lives by hundreds together, chiefly in church-towers and other similar localities, issuing forth in the evening to prey upon the insects which fly at that time. Moths are said to be its favourite victims, and the harder parts of these insects, with portions of the wings, are found unaltered in the Bat's excrement. Notwithstanding their social habits, these Bats are exceedingly quarrelsome; they fight vigorously with their sharp teeth and the claws of their thumbs, often tearing each other severely, and even breaking the slender bones in the wings of their adversaries.

HEAD OF MOUSE-COLOURED BAT.

NATTERER'S BAT.†

The Reddish-grey Bat, or Natterer's Bat (*Vespertilio Nattereri*), is an undoubted native of this country, although it appears to be local in its distribution. It has been taken near London, at Swaffham in Cambridgeshire, at Colchester and Norwich, at Chislehurst (hibernating in a chalk cavern), and at Arrow, near Alcester, in Warwickshire. It has also occurred in Ireland. It inhabits the continent of Europe from the Ural Mountains westward to Belgium and France, and in the south occurs on the shores of the Mediterranean. Apparently its range does not extend into Asia.

Natterer's Bat has the fur reddish-grey above, and whitish beneath, the hairs of which it is composed being dark towards the base, with light tips. The ears are oblong-ovate, and about as long as the head, and the tragus is nearly two-thirds the length of the ear; but the most distinctive character of the species consists in the margin of the interfemoral membrane, from the tips of the spurs to that of the tail, being fringed with a row of long stiff hairs. In its social habits this Bat seems to agree with the Mouse-coloured Bat, but is much more amiable in its disposition. Specimens received by Mr. Bell from a cavern in the chalk at Chislehurst (where they were found hibernating in company

* *Vespertilio murinus.* † *Vespertilio Nattereri.*

with several other species) were kept alive for a time by feeding them on bits of raw meat, and exhibited "great familiarity of disposition, not only by their friendliness towards their companions, but by their readiness in taking food from the hand, and in allowing themselves to be interfered with without evincing fear or anger." These Bats were active in their habits, running and climbing about the cage with great agility. The sociability of character of Natterer's Bat is still more strikingly shown by the curious description given in the second edition of Bell's "British Quadrupeds" of a colony observed in the roof of Arrow Church, near Alcester. In a dark retreat, between the ceiling of the church and the tiled roof, "the Bats were seen adhering, by all their extremities, to the under surface of the row of tiles which forms the crest or ridge of the roof (partly supported, however, by the upper tier of roof-tiles on which the ridge-tiles rested), and others clinging to them, until a mass was made up three or four inches thick, six or seven wide, and about four feet in length. It would be wrong to call this their place of repose, as they presented a most singular scene of activity, the constant endeavour of those outside being to penetrate the mass, probably for warmth; and to do this they were continually poking their noses between those nearest to them, and then forcing in their bodies, to be in their turn again pushed to the outside. In this manner a regular bickering was kept up in the whole mass. However, they seemed to be very gentle, and to have no idea of biting or otherwise annoying each other."

DAUBENTON'S BAT.*

Daubenton's Bat is another species which is almost confined to Europe. It is generally distributed over that continent from Finland and the Ural Mountains to Ireland and the Mediterranean, but is only of doubtful occurrence in North-western Asia. It is about two inches in length; its ears are about three-fourths the length of the head, oval, with the outer margin sinuated, and the inner margin folded in; the tragus is narrow, rather obtuse at the apex, and about half the length of the ear; the tail is longer than the body; the fur is usually reddish-brown, but sometimes dark brown or greyish-brown above, and ash-grey beneath; and the wing-membranes show a slight reddish tinge.

The habits of this Bat are very peculiar. It usually takes up its residence in church-towers and other buildings, but sometimes in hollow trees, and always in the vicinity of water, its active life being passed in flying over the surface of water. Its flight is not very rapid, and is performed by means of very slight but rapid strokes of the wings. It flies usually close to the surface, and from time to time dips its nose into the water, probably for the purpose of drinking. This Bat is gregarious in its habits, great flocks being generally seen flying about together, and considerable numbers always inhabit the same retreat. In confinement it seems to be very delicate, and does not live long; but it is quiet and gentle in its behaviour, and will drink milk from the palm of the hand, and feed upon small pieces of meat and house flies. The latter, according to Mr. Bell's editors, are favourite morsels with these Bats, and "it was curious," they say, "to see them poke their little noses between the fingers for flies which were concealed there. A fly put on a smooth table was always a tempting but tantalising bait for them, for the Bats, in attempting to take hold of it, almost invariably pushed it to the outside of the table, from which it fell and was lost." In Britain, Daubenton's Bat has been taken in various localities, extending as far north as Aberdeenshire; and in Ireland it has occurred in Donegal and Kildare.

THE WHISKERED BAT.†

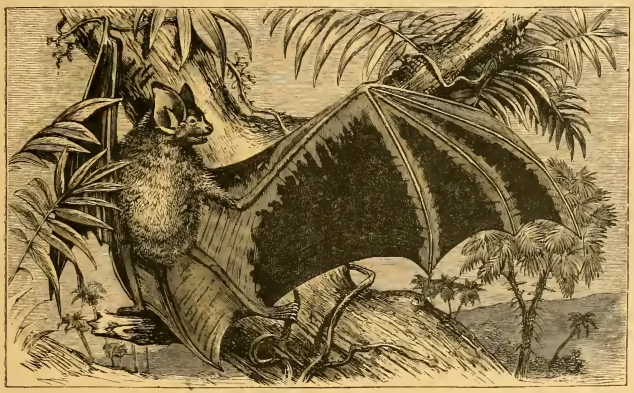
The Whiskered Bat inhabits all Central Europe from the Alps to Finland, and from Russia to Ireland. It is also found among the Himalayas, and is said by Schrenck to occur in the Amoor country, so that its distribution in Asia is probably rather wide. In England its occurrence has been recorded in Cambridgeshire, Northamptonshire, and Warwickshire, at Colchester and at Chislehurst, and in Ireland in the county of Clare. The Whiskered Bat is a small species, the head and body measuring only one inch and two-thirds in length. Its colour is dark chestnut-brown above, ashy brown beneath; the ears bend outwards and have the outer margin notched; the tragus is half the length of the ear; the face is very hairy, and the hairs on the upper lip are longer than the rest, so as

* *Vespertilio Daubentonii.* † *Vespertilio mystacinus.*

to form a moustache, whence the name of the species. This Bat is solitary, being generally found singly in its resting-places, which consist of holes in walls, the roofs of houses, and, in general, any dark crevice or corner. It resembles the Pipistrelle in its flight and general habits, and is doubtless often mistaken for that species.*

THE BLACK AND ORANGE BAT.†

This species, which has been referred by various authors to different genera, is especially remarkable for its peculiar coloration. The muzzle is of a conical form; the ears ovate, with the rounded tips projecting outwards, so as to render the outer margin concave for some distance; the tragus long, narrow, and obtusely pointed; the fur is soft and thick, of a reddish-yellow colour above, and pale



BLACK AND ORANGE BAT.

yellowish beneath; and the wing-membranes, which are very broad, are singularly variegated with bright orange and brownish-black. The dark portions form irregularly triangular patches on the membranes between the second and third and third and fourth fingers, and between the fourth finger and a line drawn from the wrist to the ankle. All the rest of the membrane, including the ears and interfemoral membrane, are orange, this colour forming narrow bands along the course of the fingers, and also extending more or less in the form of specks and streaks over the dark patches. The length of the head and body in this Bat is from two inches and a third to two inches and a half, and the expanse of the wings twelve inches and a half. It is found in the Himalayan region in Nepaul and at Darjeling, in the Khasia Hills, and in China at Shanghai, Kiang, and Amoy.

This beautiful Bat presents a remarkable resemblance in coloration to another Eastern species

* Other European species are Bechstein's Bat (*Vespertilio Bechsteinii*), which has occurred in the New Forest; the Marsh Bat (*Vespertilio dasycneme*), which inhabits the Altai Mountains, and in Europe extends, according to Mr. Dobson, from Russia to England; Capaccini's Bat (*V. Capaccinii*), an inhabitant of Italy, with which specimens from the Philippine Islands and Japan have been identified; and the Notched-eared Bat (*V. emarginatus*), found in Central and Southern Europe, and extending eastward into Persia.

† *Vespertilio formosus.*

(the Painted Bat), to which we shall presently refer; and, indeed, by some zoologists it has been placed in the same genus (*Kerivoula*) with the latter. Mr. Swinhoe, in his memoir on the Mammals of Formosa (*Proc. Zoc. Soc.*, 1862, p. 357), refers to a species which he regards as allied to the Black and Orange Bat and the Painted Bat, but which was most probably the former, in the following terms:—"The body of this Bat was of an orange-brown, but the wings were painted with orange-yellow and black. It was caught, suspended head downwards, on a cluster of the round fruit of the Longan tree (*Nephelium longanum*). Now this tree is an evergreen, and all the year through some portion of its foliage is undergoing decay, the particular leaves being, in such a stage, partially orange and black. This Bat can therefore at all seasons suspend from its branches, and elude its enemies by its resemblance to the leaf of the tree. It was in August when this specimen was brought to me. It had at that season found the fruit ripe and reddish-yellow, and had tried to escape observation in the semblance of its own tints to those of the fruit." This example of "protective mimicry," if such is really its nature, is reproduced, as already stated, in the Painted Bat, and also, as remarked by Mr. Dobson, in Welwitsch's Bat from Western Africa.

THE PAINTED BAT.*

A small group of Bats, nearly related to the preceding, is distinguished as forming a distinct genus under the name of *Kerivoula*, originally proposed and founded on a native Cingalese name by the late Dr. Gray. These Bats have the apertures of the nostrils perfectly circular; the first and second pre-molars in the upper jaw nearly as large as the third pre-molar, the ears large and funnel-shaped, the outer portion sweeping forward very much, and the spur of the heel long and stout, and curved backwards.

The Painted Bat (*Kerivoula picta*) has been already referred to as one of the species remarkable for their coloration. It is a small species, having the head and body only an inch and a half to an inch and three-quarters long. Its fur is of a deep orange colour above and paler beneath. The ears and interfemoral membrane, and the portions of membrane in front of the bones of the arm, are likewise deep orange, as are also the basal portions of the wing-membranes, broad bands bordering all the bones of the arms and fingers, and the hinder margin of the portions of membrane between the feet and the extremities of the fourth fingers, and the remainder of the wing-membranes being occupied by large triangular patches of deep black, more or less variegated with orange spots and streaks.

This remarkable Bat is found in many parts of the Peninsula of India, and also in Ceylon, Burmah, Sumatra, and Java; in fact, Mr. Dobson thinks that it is probably distributed in all parts of tropical Asia. It haunts the forests, and is very active in pursuit of insects. When disturbed in the day-time, according to Dr. Jerdon, it looks more like a Butterfly or a Moth than a Bat, and we may easily believe that the character and arrangement of its colours will give it an exceedingly un-batlike aspect. For its place of repose it selects the folded leaf of the plantain, and, according to Dr. Kelaart, its native Cingalese name of "Kehelvoulha" (from which the generic name is derived) signifies "Plantain Bat." The other species of this genus present nothing remarkable.

THE HARPY BAT.†

The *Harpiocephali* are a curious group of Bats almost entirely confined to the Himalayan region, only two species being found elsewhere, namely, in the islands of Java and Sumatra, and one of these is also a Himalayan species. The most striking character of the genus is one which it displays in common with the Harpy Fruit Bat (*Harpyia Pallasii*) already described, namely, the remarkable prominence of the nostrils, which project in a tubular form on each side of the muzzle. These Bats are further distinguished by the hairiness of the upper surface of the interfemoral membrane, which is sometimes entirely, and never less than half covered with hair, the wing-membrane being also generally hairy for a greater extent than in other allied species.

The Harpy Bat (*Harpiocephalus harpia*) is about two inches and a half long, with a tail nearly two inches in length. Its fur is very soft and silky, that of the upper surface brownish or

* *Kerivoula picta.* † *Harpiocephalus harpia.*

whitish-grey, with the tips of the hairs red, producing a bay or reddish-brown tint on the back, whilst the head, neck, and shoulders show more of a greyish cast; and that of the lower surface entirely grey. The membranes are of a reddish-brown colour, clothed above with hairs of the same tint on the basal part of the wings, and over the whole surface of the interfemoral membrane. The ears are broad, and rounded at the tip. This fine Bat has been observed in India, at Darjeling, and the Khasia Hills; it is also an inhabitant of Java and Sumatra.

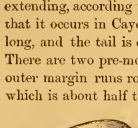
SKULL OF HARPY BAT, ENLARGED.

The skull and jaws in the Harpy Bat exhibit indications of considerable strength; in fact, the general aspect of the skull is very Dog-like, and the large size of the coronoid process of the lower jaw would seem to indicate that the whole is intended to form a powerful masticating apparatus. This notion is further borne out by the character of the teeth, which are very stout, the molars being furnished with short, blunt cusps, thickly coated with enamel, and admirably fitted to crush the hard cases of the Beetles, which appear, from the contents found in its stomach, to constitute the principal food of this Bat. Mr. Dobson remarks that "as we become better acquainted with the habits of these animals, it will probably be found that the food of this species is restricted to certain species of Coleoptera possessing extremely hard cases, which would effectually resist the feebler, although more acutely-pointed teeth of other Bats inhabiting the same localities. The form of the teeth, the great development of the coronoid process, and the shortness of the mandible, are all evidently subservient to the same object, and have been modified simultaneously to suit the food of the animal."

THE RED BAT.*

The genus *Atalapha*, to which the Red Bat of North America belongs, is very nearly related to *Nycticejus*, and in fact its species have been not unfrequently placed in that genus. In general characters the two groups closely agree, but the head in *Atalapha* is more elevated, and the interfemoral membrane is wholly, or to a very considerable extent, clothed with hair. This latter character, with the presence of only two incisors in the upper jaw, serves at once to distinguish the species of this genus, which are confined, like those of *Nycticejus*, to the Western hemisphere.

The Red Bat is generally distributed over all the temperate parts of North America, even extending, according to Peters, as far north as the Aleutian islands, whilst Geoffroy and Temminck state that it occurs in Cayenne and Surinam. The head and body are usually rather less than two inches long, and the tail is of about the same length; the expanse of wing is from eleven to twelve inches. There are two pre-molar and three molar teeth on each side. The ears are irregularly rounded, and the outer margin runs round upon the cheek, and forms a distinct lobe below the origin of the tragus, which is about half the height of the ear, and turns inwards at the point. The fur is long and silky, and is generally of a light russet colour, tinged with yellow, darker and richer on the back. The colour, however, varies, specimens being met with showing fawn-coloured and even yellowish-ashy tints. At each shoulder there is a tuft of white hair. The interfemoral membrane is entirely covered above, and half covered beneath, with hair of the same colour as that on the body. The membranes are of a rich brown colour, and the ears and lips are marked with yellow. The above furnishes indications only of the general effect produced, but each hair is dark lead-colour at the base, then yellowish-brown, passing into dark or bright red or chocolate colour, with the extreme tip generally white. Northern specimens usually show the darker tints, while those from warmer regions are more frequently of a bright red colour.



SKULL OF RED BAT. (*After Allen.*)

Dr. Allen quotes the following anecdote, illustrating the force of the maternal instinct in this little Bat:—A lad had caught a young Red Bat, which he took home with him. "Three hours afterwards, in the evening, as he was conveying it to the museum, in his hand, while passing near the place where it was caught, the mother made her appearance, and followed the boy for two squares,

* *Atalapha noveboracensis.*

flying around him, and finally alighted on his breast, such was her anxiety to save her offspring. Both were brought to the museum, the young one firmly adhering to its mother's teat. This faithful creature lived two days in the museum, and then died of injuries received from her captor. The young one being but half grown, was still too young to take care of itself, and died shortly after."

The Hoary Bat (*Atalapha cinerea*) is larger than its congener, the Red Bat, measuring from two to three inches in length, and from twelve to fifteen inches in expanse of wing. Its colours, also, are quite different. The head and neck are of a faded yellow colour, the back brownish chocolate or umber smoky fawn-colour, and the lower surface fawn-colour, darker on the breast. All the hairs are tipped with white, which gives the animal the peculiar ashy tinge alluded to in its name. The whole upper surface of the interfemoral membrane, and about one-third of its lower surface, are clothed with hair. The Hoary Bat is distributed over the whole of North America, as far north as Canada and the Hudson's Bay Territories.*

SCHREIBERS' BAT.†

Several species of Long-tailed Bats, peculiar to the Eastern hemisphere, have been formed into the genus *Miniopterus*, which differs from all the preceding forms by having the crown of the head abruptly and very considerably raised from the face, and the upper incisors in pairs separated not only from each other, but from the canines. They have the ears separate, with their outer margins extending forward nearly to the opening of the mouth; the nostrils simple; the first phalanx of the second finger very short; and the tail as long as the head and body, and entirely enclosed within the interfemoral membrane.

Schreibers' Bat, the type of this genus, is very remarkable for its extraordinary geographical range; for, according to the determinations of Messrs. Tomes and Dobson, it extends from Japan through the Eastern Archipelago to Australia, and westward of these localities through Burmah and Ceylon to Asia Minor, and thence into Southern Europe. It is also generally distributed in Africa, and occurs in Madagascar. On the continent of Europe it is found as far north as Switzerland and Lower Austria.

The species varies considerably in the colour of its fur. The basal half of the hairs is always dark, either brown, greyish-black, or black, with the extremities sometimes of nearly the same tint, but generally lighter, varying from a light grey, even becoming whitish on the lower surface, to reddish-grey and reddish-brown. Specimens from tropical localities are generally dark in colour. The ears are much shorter than the head, and sweep almost completely round the eye (whence the name of "*blepotis*" was given to the Eastern form by M. Temminck), terminating near the angle of the mouth in a small square-ended lobe. The tragus is much shorter than the ear, about twice as long as broad, and rounded at the tip. The total length of this Bat is about four inches, half of which goes to the head and body, and the remainder to the tail. Schreibers' Bat is an inhabitant of caves. It was originally obtained from the caverns of the Banat, but occurs generally throughout Southern Europe. In the East it is also said by M. Temminck to find a retreat in caves and clefts in the rocks. It is very common in Java, but rarely appears in the open country.‡

THE BROWN PIG BAT.§

This is another of the forms occupying the border-land between the families of *Vespertilionidæ* and *Emballonuridæ*, and assisting to unite the whole of the simple-nosed Insectivorous Bats in one great series. In the form of the head, and in the dentition, it resembles especially *Natalus* and *Furia*. The wing-membranes are continued down the toes to the base of the claws; the tail is long, and enclosed,

* Other recorded species of this genus are: *A. intermedia*, from Mexico, *A. Pfeifferi*, from Cuba, *A. Frantzii*, from Brazil and Costa Rica, *A. varia*, from Peru and Chili, *A. pallescens*, from Venezuela, and *A. Grayi*, from Chili, all with molars $\frac{5-5}{5-5}$; and *A. egregia*, from Brazil, *A. Ega*, from Brazil, and *A. caudata*, from Pernambuco and Chili, with molars $\frac{4-4}{5-5}$. *A. Gravi* has been said to occur at Juan da Fuca, in North America, and in the Sandwich Islands.

† *Miniopterus Schreibersii.*

‡ Other recorded species are *Miniopterus tristis*, from the Philippine Islands, and *M. australis*, from the Loyalty Islands.

§ *Thyroptera tricolor.*

except the last joint, in the interfemoral membrane, which is supported by long heel-spurs, beyond which there are membranous lobes; and the thumbs are free and clawed, and, like the soles of the feet, furnished with curious adhesive discs. The toes consist of only two phalanges each, as in the genus *Phyllorhina*. The genus was described by MM. Lichtenstein and Peters under the name of *Hyonycteris* (Pig Bat), in allusion to the elongated and truncated form of the muzzle, which has somewhat of a Pig-like aspect.

FOOT AND THUMB OF THE BROWN PIG BAT, ENLARGED. (From the *Proceedings of the Zoological Society.*)

The singular adhesive organs mentioned above as occurring on the thumbs and feet of this Bat, are described in considerable detail by Mr. Dobson in the "Proceedings of the Zoological Society." He remarks that they constitute the only known instance of the possession by Mammals of prehensile organs at all resembling the sucking-discs of the Cephalopodous mollusca. "On the inferior surface of the thumb," he says, "from the base of the first phalanx, ... corresponding to the position of the ball of the thumb in other Bats, arises, by a short peduncle, a hollow suctorial disc about one-tenth of an inch in diameter. On the sole of the foot a similar but considerably smaller disc is placed, not in the same relative position, however, as in the thumb; for it covers the metatarsal bones, not the bases of the first phalanges of the toes." According to a Spanish writer, Señor Jimenez de la Espada, these discs were used by the animal to fasten itself to the fingers as it tried to bite, producing the same feeling as a key or thimble when applied to the tongue after sucking out the air; and it is added, "the muscular arrangement is such as to allow the animal to vary the diameter of the organ; and by their means the animals attached themselves to the sides of the box in which they are kept, although, when sleeping, they suspended themselves by the claws like other Bats." Mr. Dobson, however, by careful examination of the structure of the discs, convinced himself that the Spanish zoologist was mistaken in ascribing any muscular arrangements to these curious organs, which consist exclusively of an unusual development of the skin and subcutaneous tissue, amongst which a radiating cartilaginous structure probably gave rise to the notion of a special muscular apparatus. Mr. Dobson indicates further that the discs of the feet are supplemented by several small projections from the hinder border of the heel-spur, which are known to occur in no other species of Bat, and he regards the whole of these peculiarities as indicating that the animal is specially adapted for climbing, like the New Zealand Bat (*Mystacina tuberculata*), and that in all probability both these species are in the habit of capturing the insects on which they feed while crawling over the branches of trees.*

The Brown Pig Bat (*Thyroptera tricolor*) is an inhabitant of South and Central America. Its head and body are rather more than an inch and a half long, and the tail about an inch and a quarter. The fur is of a cinnamon-brown colour, paler beneath, and the wings dusky brown.†

THE STRAW-COLOURED BAT.‡

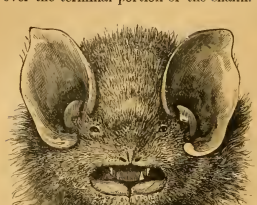
In this curious little Bat, as in *Furipterus* and *Miniopterus*, which with it form the links of connection between the two families of simple-nosed Insectivorous Bats, the crown of the head is also much elevated and separated from the muzzle by a strong depression. The nostrils are placed quite at the tip of the nose, and close to the upper lip (see figure, p. 312), the chin has a semicircular double row of warts, the ears are large, broad, somewhat pointed at the tip, which is turned outwards, so as to make the outer margin appear excavated, whilst below it sweeps round upon the side of the face as a free lobe, and the tragus, which is short, broad, and fleshy, rises from the end of a short stalk projecting horizontally from the inside of the opening of the ear. The wings are of moderate length, and rather broad, and are attached to the ankle in a most singular manner. Their point of attachment is not, as usual in Bats, on the outside, but on the inside of the ankle, so that a narrow strip of membrane has to cross

* Mr. Dobson's paper above referred to ("Proceedings of the Zoological Society," 1876, p. 526) contains some interesting particulars as to the occurrence of adhesive organs in Bats and other Mammals.

† A second species, *Thyroptera albiventer*, has been described by Mr. Tomes from the vicinity of the Rio Napo, near Quito. It is rather larger than the preceding, and of a reddish-brown colour above, with the lower parts pure white.

‡ *Natalus stramineus.*

over the terminal portion of the shank.



HEAD OF STRAW-COLOURED BAT.
(From the *Proceedings of the Zoological Society.*)

The thumbs are free; the legs and tail are long and slender; the latter, which consists of only seven joints, is longer than the head and body of the animal, and is almost entirely enclosed in the ample interfemoral membrane, the posterior margins of which are supported by long spurs springing from the heels. All the membranous parts, including the ears, are thickly marked with dotted lines. There are four incisor teeth in the upper jaw, placed in pairs, and separated by a space from the canines. There are three pre-molars in both jaws. (Dental formula—incisors, $\frac{2-2}{6}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{3-3}{3-3}$, molars, $\frac{3-3}{3-3}$.)

The Straw-coloured Bat measures about four inches in total length, fully one-half of which is occupied by the tail. It is clothed with a moderately-long fur, of a brownish-yellow colour, paler on the lower surface. The membranes are reddish-brown. It is an inhabitant of South and Central America.

CHAPTER V.

EMBALLONURINE ALLIANCE.

FAMILY V.—EMBALLONURIDÆ, OR THICK-LEGGED BATS.

Characteristics of the *Emballonuridæ*, or Thick-legged Bats—Cuvier's Fury—The Genus *Saccopteryx*—Striped Sack-winged Bat—The Pouch or Sac in the Wing-membrane—Dentition—Mountain Bat—Tomb Bat—Origin of its Name—Dentition—The peculiar Sac or Pouch under the Chin—Other Species of the Genus (note)—Egyptian Rhinopome—Difficulty of assigning its true place in the System—Characteristics—Great Hare-lipped Bat—Seba's Description—Linnæus's Mistake—Dentition—Distribution—The Genus *Nyctinomus*—Cestoni's Bat—Pale Chestnut Mastiff Bat—Distribution—Habits—Smoky Mastiff Bat—Habits—Collared Bat—Hideous Ugliness—Characteristics—New Zealand Short-tailed Bat—Characteristics—Mr. Dobson on the Wing-membrane, Thumb, and Foot.

This family is the first of the second great group into which Mr. Dobson divides the ordinary Bats, and it includes many forms which are almost as typically Bats as the *Vespertilionidæ* themselves. As in the *Vespertilionidæ* the nostrils are simple, that is to say, they are quite destitute of foliaceous appendages, except in one curious genus (*Rhinopoma*), which has a very small nose-leaf. The character of the folding of the first phalanx of the middle finger in repose upon the upper surface of the metacarpal bone has already been mentioned as distinguishing the members of this alliance generally. It is subject to two exceptions in the present family, being extended in a line with the metacarpal bone, in the same way as in the Vespertilionine Bats, in the curious genus *Noctilio*, and folded *beneath* the metacarpal in the equally singular genus *Mystacina*. In the latter genus, moreover, the middle finger has three phalanges, the number of these bones in all other *Emballonuridæ* being two. The legs are short and stout, and have the two bones of the shank (tibia and fibula) nearly equally developed; the tail has its basal portion enclosed within the interfemoral membrane, but perforates this on the upper surface, at or beyond the middle, and is usually continued as a free organ for a considerable distance beyond this point; and the upper incisor teeth are generally two in number.

The members of this family, which are insectivorous in their habits, are chiefly confined to the tropical and sub-tropical regions of both hemispheres. A single species inhabits Europe, and one is found in New Zealand.

CUVIER'S FURY.*

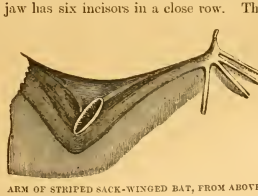
A curious little South American Bat, described by F. Cuvier under the name of *Furia horrens*, is of interest to the zoologist as one of the links between the two great groups of Microchiroptera. It is remarkable for the form of its muzzle, which is somewhat Pig-like, cut off and turned up at the extremity, and bristling all over with hairs. The tragus is in the form of a barbed arrow-head; and the thumb is exceedingly short, and entirely enclosed within the membrane, only the claw being left free. The canine teeth in the upper jaw are very peculiar, showing four points. This Bat is only about an inch and a half long. Its eyes are large and prominent, its nostrils surrounded by slightly-raised borders, and its chin bears eight white warts, seven running round the lip, while the eighth stands in the centre. The fur is soft, thick, and black. A second species of the genus, also from South America, is described by Mr. Tomes under the name of *Furipterus cœrulescens*. Its fur is of a slaty blue tint.

DENTITION OF STRIPED SACK-WINGED BAT, ENLARGED. (*After Peters.*)

WING OF STRIPED SACK-WINGED BAT, FROM BELOW.

THE STRIPED SACK-WINGED BAT.†

The genus *Saccopteryx* is readily distinguished from all others by the existence in the membrane in front of the arm (the shoulder membrane or antebrachial membrane) of a singular sac or pouch, which is situated on the lower surface of the membrane near the elbow, and opens at the upper surface in a corresponding position.‡ This sac is not peculiar to the males, but occurs in both sexes. There are in the upper jaw only two incisor teeth, which are small and separated by an interval from each other and from the canines (see figure above). The lower jaw has six incisors in a close row. The canines are strong and sharp, especially the upper ones; the first pre-molar is small, the second larger and acute, and the three true molars are large and strongly tubercular. The ears are of moderate size, and furnished with well-developed tragi. The interfemoral membrane occupies the whole space between the legs, and is stretched by a pair of long spurs, between which the hinder margin is either straight or incurved, and the basal portion of the short tail is enclosed in the membrane, from the upper surface of which its tip projects. The species of this genus are all American.



ARM OF STRIPED SACK-WINGED BAT, FROM ABOVE.

The Striped Sack-winged Bat is rather a small species, measuring about two inches and a quarter from the tip of the nose to the base of the tail. Its fur is tolerably long, full, and lustrous, that of the upper surface dark brown, with two white streaks running

* *Furipterus horrens.* † *Saccopteryx bilineata.*

‡ In one species, *Saccopteryx plicata*, from Costa Rica, of which Professor Peters makes his genus *Balantiopteryx*, the sac is placed in the middle of the shoulder membrane. In this species, also, the facial part of the skull is inflated on each side. In *S. canina* and its allies the sac is in the margin of the membrane. These form the genus *Peropteryx* of Professor Peters.

down from the shoulders to the hinder extremity of the body; the lower surface is paler, the hairs having ashy tips. It is an inhabitant of Surinam.*

THE MOUNTAIN BAT.†

This species is an example of a small series of Bats which, although nearly allied to the preceding, are inhabitants of the Eastern hemisphere, the known species of the genus *Emballonura* being found in the Eastern Archipelago and Australia, and in some of the oceanic islands of the Pacific. The ears in this genus are somewhat triangular in form, with the outer margin sinuated;

MOUNTAIN BAT.

the tragus is truncated, slightly widened at the tip, and furnished with a small blunt projection at the base of the outer margin; the muzzle is somewhat elongated, with curved nostrils situated in a rounded pit; the interfemoral membrane is large, and stretched by long spurs. There are four incisor teeth in pairs above, and six below, and two pre-molars and three molars on each side in each jaw.

The Mountain Bat (*Emballonura monticola*) is a very small creature, measuring only an inch and a half in length, with a tail nearly half an inch long, the extremity of which protrudes from the back of the interfemoral membrane. The wing-membrane springs from the ankle. The general colour of the fur is a chocolate-brown, lighter on the lower surface, the hairs being in all parts chocolate-brown at the tips. Their basal portions are yellowish-white on the back and brown on the belly. The membranes are entirely naked.

This Bat is an inhabitant of Java, Sumatra, Borneo, and the Philippine Islands, where it lives in the wildest and most solitary regions of the mountains. It is social in its habits, considerable troops

* Other described species of the genus are *Saccopteryx canina*, from Brazil, Guiana, Venezuela, and Guatemala; *S. leptura*, from Surinam; *S. villosa*, from Brazil; *S. Kappleri*, and *S. leucoptera*, from Surinam; *S. brevirostris*, from Brazil; and *S. plicata*, from Costa Rica. *Rhynchonycteris naso*, the Sharp-nosed Bat, is allied to these, but distinguished especially by its very pointed snout. It inhabits Brazil, Surinam, and Guiana.

† *Emballonura monticola*.

of them sleeping suspended from the surfaces of perpendicular rocks, under the shade of the overhanging trees and shrubs. They are said to be unsavoury little beasts, their presence being perceptible, even at a considerable distance, by the strong and disagreeable odour with which they contaminate the air.*

THE TOMB BAT.†

During the French expedition to Egypt under the first Napoleon, M. Geoffroy, one of the *savants* who accompanied the army, discovered a species of Bat inhabiting the tombs of the ancient kings of Egypt, which differed in many important characters from all previously known Bats. He made it the type of a new genus, to which he gave the name of *Taphozous*, in allusion to its tomb-haunting habits. Some other species have since been discovered in various parts of the Eastern hemisphere.

SKULL OF TOMB BAT, ENLARGED.

The *Taphozoi* have a rather short and broad head, with a tapering muzzle, its breadth behind the eyes being due to the wideness of the zygomatic arches. The ears are separate, and their outer margins sweep round upon the cheek, terminating near the angle of the mouth; the tragus is short, somewhat widened at the apex, so as generally to have a hatchet shape; the wings are long and narrow, and the interfemoral membrane is ample, and stretched by very long spurs, between the tips of which its hinder margin is concave; the base of the tail is enclosed in the membrane, from which its tip projects. The teeth, especially the canines and upper true molars, are powerful, and the latter show the W-shaped cusps very distinctly. There are three molars and two pre-molars in each jaw, but in the upper jaw the hindmost molar is reduced to a narrow transverse plate, as shown in the figure, and the first pre-molar is so small as scarcely to project above the gum. In the lower jaw there are four small incisors; but in the upper jaw the pre-maxillary bones are represented only by cartilage, which in the young, and sometimes in adult animals, bears a pair of minute teeth, separated from each other by a wide space, but these apparently frequently drop out as the animal advances in age. In consequence of this structure, the skull presents a peculiar appearance. The intermaxillary cartilage being lost, the front of the face presents a deep notch between two projecting processes which bear the canine teeth, and even during life the lower jaw extends further forward than the upper one, so that its incisor teeth press only against the upper lip.

DENTITION OF TOMB BAT, ENLARGED.

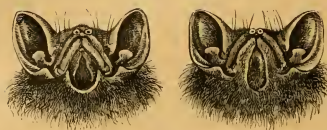
Another curious character presented by most of these Bats is the existence under the chin of a peculiar pouch (see figure, p. 316), which sometimes occurs in both sexes, although smaller in the females, and is sometimes altogether wanting in the latter. In some, the place of this sac, which is evidently of a glandular nature, seems to be represented by a group of small pores. The purpose of this peculiar arrangement is not clearly known; but from the greater development of the organ in the males of those species which possess it, it would appear to be of a sexual character. The peculiar wing-pouches which characterise the genus *Saccopteryx* are wanting in these Bats; but in most of them there is a small membranous band, enclosing the angle formed by the tip of the fore-arm and the base of the fifth finger, and thus forming a little pouch.

The Tomb Bat (*Taphozous perforatus*) is one of those which presents a pouch of this description, and the male also possesses a large throat-sac, which is altogether wanting in the females. It is about three inches in length, exclusive of the tail, which is thin at the extremity; the wing-membranes

* Other known species are *Emballonura nigrescens*, from Amboyna, Ternate, and Australia; and *E. semicaudata*, an inhabitant of the Samoa, Fiji, and Pelew Islands. An allied African species is *Coleura afra*, which, however, presents some characters indicating a relationship to the American *Saccopteryx*.

† *Taphozous perforatus.*

extend down to within about a quarter of an inch of the ankles, and the heel-spurs are about as long as the tibia. The body is covered with short dark-brown fur, which extends over the bases of the wings, and down the interfemoral membrane as far as the point where the tail emerges from it.



HEAD OF MALE AND FEMALE LONG-ARMED BAT. (*After Dobson.*)

This is the species originally discovered by Geoffroy in the chambers of the Pyramids, and other tombs and buildings in Egypt. It is said also to inhabit Sennaar and Senegal. It flies in the evening, passes the day in the darkest places it can find, and feeds exclusively upon insects. These habits, indeed, appear to be common to all the species of the genus.*

THE EGYPTIAN RHINOPOME.†

This Bat, described by the French traveller and naturalist Belon, about the middle of the sixteenth century, under the name of the Egyptian Bat (*Chauve-Souris d'Egypte*), is one of the most singular members of the order Chiroptera. It presents so curious a combination of characters that its place in the system has always been uncertain; and owing to the presence of a small nose-leaf, it has hitherto been arranged by different writers with the *Phyllostomata*, the *Rhinolophidæ*, and the *Nycteridæ*. Its true place, according to Mr. Dobson's recent researches, appears to be with the *Emballonuridæ*, with which, and especially with the *Taphozoi*, it certainly agrees closely in the form of the skull and the dentition. This view of the relationships of the genus *Rhinopoma* seems also to have struck Cuvier, who, while placing the genus next to *Nycteris*, makes *Taphozous* immediately follow it.

HEAD OF MALE AND FEMALE BLACK-BEARDED RAT. (*After Dobson.*)

The genus is characterised by having the crown of the head considerably elevated, with a deep concavity in the forehead between the eyes, as in *Taphozous;* the muzzle considerably elongated beyond the opening of the mouth; the nostrils of valvular structure, situated in the anterior margin of a very small, erect nose-leaf, which bears some resemblance to those of the Phyllostomes; the ears rather large, united upon the forehead (a Nycterid character), and furnished with a well-developed tragus; and the tail long and slender, and free throughout almost its whole length from the interfemoral membrane, which is exceedingly short. The upper incisors are two in number, and of very small size, inserted in intermaxillary bones which unite with the maxillaries by slender processes, a character which also occurs in *Emballonura*. In the lower jaw there are four incisors in a close row. The canines are strong, and followed on each side by a single pre-molar in the upper, and two in the lower jaw; and there are three true molars with W-shaped cusps on each side in both jaws: thus the dental formula is—incisors, $\frac{1-1}{4}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{1-1}{2-2}$, molars, $\frac{3-3}{3-3}$. The index finger consists of three joints, a metacarpal bone and two phalanges, a structure which occurs in no other Insectivorous Bats.

SKULL OF RHINOPOME. (*After Dobson.*)

* Other described species of the genus are:—*Taphozous longimanus*, with a large throat-sac in the male, found in India, Ceylon, and Burmah; *T. melanopogon*, with no throat-pouch, but usually with a small black beard under the chin (see figure above), an inhabitant of India, Penang, Burmah, Cochin China, Java, and the Philippine Islands; *T. Theobaldi*, from Tenasserim; *T. australis*, from Australia and New Guinea; *T. mauritianus*, with white wings, from tropical Africa, Madagascar, and the Mascarene Islands; *T. saccolaimus*, from India and the larger Eastern islands; *T. affinis*, from Labuan; and *T. Peli*, from tropical Africa. The Valve-tailed Bat (*Diclidurus albus*), a native of Brazil, is remarkable for its whitish colour, and especially for the presence of a curious horny case, composed of two parts, which covers the extremity of the tail, and is attached to the upper surface of the interfemoral membrane.

† *Rhinopoma microphyllum*.

The Egyptian *Rhinopome*, which is probably distributed over a considerable portion of the African continent, is a small Bat, the length of the head and body being only about two inches and a quarter. The portion of the tail free from the membrane is about the same length as the head and body, and the inter-femoral membrane encloses about another half-inch. It has a nearly naked face, along the middle of which a narrow groove runs back from the base of the little nose-leaf to the deep concavity situated in the forehead between the eyes; the wing-membranes are attached to the tibia for about two-thirds of the length of the latter, and are entirely free from hair; and the small development of the membranes, coupled with the comparatively great length of the limb-bones, renders this Bat more active in walking than most of his fellows. The fur is short, and leaves a good deal of the hinder part of the back naked; and the bare skin thus exposed, as well as the base of the wings, is curiously wrinkled, a character which this species has in common with certain species of *Taphozoi* and *Molossi*.

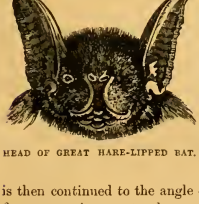
EGYPTIAN RHINOPOME.

The Egyptian Rhinopome is found commonly in Egypt, where it frequents the numerous ruins and old buildings with which that country abounds, and is particularly abundant in the dark galleries and chambers of the Pyramids.*

THE GREAT HARE-LIPPED BAT.†

In Seba's well-known illustrated book on Natural History a peculiar species of Bat is described and figured under the name of "*Vespertilio cato similis americanus*." It may be doubtful whether any of our domestic Grimalkins would be much flattered by the likeness thus briefly indicated (see figure), but there can be no doubt that the animal in question was a Bat, and as such it duly appears in the earlier editions of the "Systema Naturæ" of Linnæus. By a curious misapplication of the very sound principle of not being guided exclusively by external characters, the great Swedish naturalist was led in the last edition of his work (in which he founded the genus *Noctilio*) to refer the animal to the Rodents, on the ground of the apparent presence of only two incisors in each jaw.

A glance at the dentition of a *Noctilio* will at once show how Linnæus was misled, and at the same time that it has all the dental characters of a Bat. In the upper jaw there are four incisor teeth, the two middle ones approximated and considerably larger than the lateral ones, which are placed quite behind them, leaving a small open space between the incisors and the larger canines, behind which comes a series of four molars showing the characteristic W-shaped cusps very distinctly. In the lower jaw there are only two small notched incisors, followed immediately by the powerful canines, behind which is a series of five molars, the first very small, the second larger, but simple and pyramidal, and the remainder with distinct cusps and ridges.



HEAD OF GREAT HARE-LIPPED BAT.

The ears in the Bats of this genus are rather large, and furnished with a small tragus, the outer margin of which is notched. The outer margin of the ear forms a rounded lobe upon the cheek, and is then continued to the angle of the mouth. The upper lip is widely cleft, forming a broad margined fissure running up to the nostrils, which are surrounded by borders raised to such an extent as to

* *Rhinopoma Lepsianum* (Peters), is another African species. It inhabits the banks of the Blue Nile.

† *Noctilio leporinus*.

give them almost a tubular appearance; and the lower lip, which is also thickened, bears several curious folds of skin; the whole in combination giving a most singular and forbidding expression to the little creature. The wing-membranes descend but little below the knee, but the interfemoral membrane is ample, stretched by very long spurs, and traversed in its basal part by the short tail, the tip of which projects from its upper surface like a little knob.

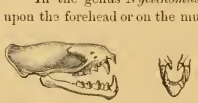
The Great Hare-lipped Bat (*Noctilio leporinus*), which is distributed over the whole of tropical and sub-tropical South America, from the West Indies in the north to Paraguay and Chili in the south, is about three inches and three-quarters in length without the tail, and has an expanse of wing of about twenty-one inches. The general colour of the fur on the back is greyish-brown or reddish-brown, but in many specimens a yellowish-white streak runs from the nape down the middle of the back to the root of the tail. The throat, neck, and belly are reddish-yellow, the ears, membranes, and other naked parts blackish-brown. The interfemoral membrane extends about two inches beyond the tail, which is three-quarters of an inch long, and the heel-spurs are more than an inch in length.

This Bat lives in large parties in hollow trees, caverns, the roofs of buildings, and even among the dense foliage of trees, but generally in the immediate vicinity of water. In the twilight they are seen in great numbers flying, almost in the same way as the Swallows in Europe, in great flocks over the surface of the water, close to which they skim with a very rapid flight in pursuit of the insects which constitute their food. The voice is described by Prince Maximilian of Neuwied as a hissing sound. According to an observation made by Mr. Louis Fraser in Ecuador, the object of the *Noctilio* in haunting the waters is not so peaceful as that of most bats, which, so far as we know, resort to the lakes and rivers only to drink. Mr. Fraser describes it as flying along the banks of rivers, and from time to time dashing down upon the surface of the water, where it captures small Crustaceans as they swim up the stream. He adds that the Bats have a fishy odour, and possibly they do not strictly confine themselves to invertebrate prey.*

CESTONI'S BAT.†

We come now to a series of Bats (the *Molossi* of Professor Peters and Mr. Dobson) which we shall treat here as belonging to three genera, the classification and nomenclature of which are attended with considerable difficulty, partly owing to the variability of characters on which we are accustomed to rely in the definition of generic groups, and partly to the confusion which has arisen in the use of the generic names employed especially by the older writers. They are all stoutly and rather clumsily built Bats, with short, thick muzzles, a character which has obtained for some of them the name of Bulldog Bats; the tail is thick, and projects beyond the margin of the interfemoral membrane, the hinder limbs are short and stout, and the fibula or second bone in the shank is well developed, often nearly as large as the tibia.

In the genus *Nyctinomus*, as we shall here restrict it, the ears are large, and generally united upon the forehead or on the muzzle in front of the eyes, either directly or by a fold of skin, and furnished with a distinct tragus, and the upper lip is more or less distinctly folded or wrinkled. The intermaxillary bones are generally separated by a cleft; and in all the species they bear two incisor teeth, which are separated by a space from each other and from the canines, whilst the lower jaw has six incisors in young animals, and usually only four in the adults. The canines are strong, and followed in the upper jaw by either four or five teeth, the number of premolars being either one or two. In the lower jaw there are always two premolars, and three true molars. The first and fifth toes are much thicker than the rest. The species of this genus occur in the warmer parts of both hemispheres.



SKULL AND FRONT TEETH OF CESTONI'S BAT. (*After Temminck.*)

Cestoni's Bat, originally discovered at Pisa, is the only species of the group that occurs in Europe, and forms the type of the genus *Dinops* of Professor Savi, now regarded as a sub-genus of *Nyctinomus*. It is one of the species with five molars in each jaw, and six incisors permanently in the

* The White-bellied Hare-lipped Bat (*N. albiventris*) is also an inhabitant of South America.

† *Nyctinomus Cestonii*.

lower jaw; and the tail extends for fully half its length beyond the interfemoral membrane, which is small, and stretched by long curved heel-spurs. A small membranous band crosses the shank, uniting the wing with the interfemoral membrane. The general colour of the fur is a mouse-grey, paler below; on the backs of the toes there are some long white hairs. The wings in this and the other species of *Nyctinomus* are long but narrow; the second finger, which runs to the tip of the wing, being very long, so long indeed that its metacarpal bone alone exceeds the fourth or hindmost finger in length. The inner toe also is rather larger than the rest, and somewhat separated from them, without, however, taking on the form and function of an opposable thumb. The head and body in this Bat are about three inches and a quarter long, and the tail rather more than two inches, of which about an inch is within the interfemoral membrane. It has a very wide distribution, being found in the South of Europe and throughout Northern Africa, and occurring also at Amoy, in China, where Mr. Swinhoe obtained specimens of it. He describes the interfemoral membrane as fitting loosely on the tail like a glove, so that it can slip up and down at the will of the animal. It flies high in the air, where it can be readily distinguished by the narrowness of its wings. A specimen that Mr. Swinhoe kept for some time alive would slip the interfemoral membrane up and down when irritated, and had the further disagreeable habit under such circumstances of protruding its eyes until they seemed ready to fall out of their sockets. In Egypt Cestoni's Bat is one of those that frequent the Pyramids and other old buildings, which must make that country a perfect paradise for Bats.*

HEAD OF CESTONI'S BAT. (From the *Proceedings of the Zoological Society.*)

THE PALE CHESTNUT MASTIFF BAT.†

This widely-distributed species belongs to the typical sub-genus *Nyctinomus*, in which the characters of the genus are most clearly manifested, the upper lip especially being very strongly folded. Its total length is about four inches, an inch and a half of which is made up by the tail, about half of which is enclosed by the interfemoral membrane. The body is covered with a thick, short, soft fur, which scarcely encroaches upon the membranes, and is composed of hairs of a fawn colour at the tips, with the basal portion whitish or light ash colour; the fawn colour is paler on the lower surface of the body. The ears are of considerable size, rounded, closely approaching each other, but not joining on the top of the head, and furnished with a small tragus. The inner margin of the ear bears a row of five or six minute warts.

This species is found commonly in South America and the West Indies, and also extends northwards into the United States, at least as far as Charleston, in South Carolina. Mr. Osburn gives an excellent account of its habits, as observed by him in Jamaica, where this Bat is often very abundant in the houses. He says, "They generally appear from half-past five to six o'clock, directly after sundown, and occasionally appear up to ten o'clock, but not in such numbers. They again make their appearance in my bedroom before dawn. The beating of their wings, with the occasional squeaking call, is quite familiar to me as the first sound of morning." Its cry resembles the sound "click-click." In the shingled roof of the house at Rowington Park, Vere, Jamaica, these Bats were exceedingly abundant, passing the day clinging together in clusters, notwithstanding the heat experienced immediately beneath the shingles. Mr. Osburn says that he "counted fourteen little heads in a mass about the size of a turnip." Under these circumstances, however, they are not all asleep. "Now and then," says Mr. Osburn, "a wing is stretched in drowsy enjoyment; and the luxury King James thought too great for subjects, and ought to be reserved for kings, is largely indulged in by Bats. First one and then another wakes up, and withdrawing one leg, and leaving itself suspended by the other alone, adroitly uses the foot at liberty as a comb, with a rapid, effective movement dressing the hair of the

* *Nyctinomus tragatus* (Dobson), from Continental India, is a nearly allied species, as also *Nyctinomus plicatus*, an inhabitant of India, Sumatra, Java, and Borneo.

† *Nyctinomus brasiliensis.*

under part and head—an action far from ungraceful. The foot is then cleaned quickly with the teeth or tongue, and restored to its first use," of suspending the animal. A little after sundown, according to Mr. Osburn, the roof is alive with movement, betrayed by squeaks and a scuffling shuffle over the boards, and the Bats scramble eagerly up the shingles, and escape through any opening they may find, shooting off with great rapidity in search of their insect prey. In March they made their exit about half-past six o'clock in the evening, returning to their dwelling-place about eight or nine o'clock. "It is then," says Mr. Osburn, "they are so particularly annoying to the inhabitants of even the most carefully kept Jamaica houses. The great majority return to the roof; but one or two vigorous little fellows come into the room, and flap about in the most unmeaning way. Nothing is more remarkable than the agility with which a dozen, in the early part of the evening, skimmed and glided by every article of furniture. But now they bang themselves against the ceiling and walls, drop on the table, get up again, when the Cat, by jumping, catches them a pat, and they fall on the floor, not much hurt, to judge by their liveliness, for Grimalkin, having performed the feat, sits down, her paws tucked under, and gravely watches the hurry of the alarmed Bat shuffling over the floor. They disturb the harmony of the evening by becoming the occupants of, and making an escapade beneath, a gentleman's coat collar, or a great sensation by getting hopelessly entangled in a lady's hair, and bite more furiously than effectively during the process of release." These restless little fellows, which must at least add considerably to the liveliness of an evening *réunion* in those parts of Jamaica where they abound, remain very active in their quarters all night, and start out in search of their breakfast so early that they return home again by five or six o'clock. They then seem to amuse themselves, before retiring to their own repose, by breaking the slumbers of the people whose evening hours they have enlivened as above described, by flying about the bedrooms with a rushing sound and many squeaks. The species is exceedingly common in Jamaica, and seems always to inhabit houses. Mr. Gosse ("Naturalist in Jamaica," p. 159) also describes the habits of this Bat, which he calls the Chestnut Mastiff Bat.*

THE SMOKY MASTIFF BAT.†

In this abundant American Bat the fur is generally of a smoky-brown colour, with the bases of the hairs whitish; on the lower surface some of the hairs are entirely white, and the rest brown, with the base and apex whitish. The length of the head and body is from three and a half to four and a half inches, and that of the tail about two inches, nearly half of which projects beyond the membrane. The heel-spurs are very long. In this and the other species of *Molossus*, the intermaxillary bones are united, and the upper incisors close together in front.‡

The Smoky Mastiff Bat is a well-known South American species, and extends also into the West Indian islands. In Jamaica it was observed and described by Mr. Gosse under the name of the Monk Bat, in allusion to the fact that he found the species living in large communities, but always of one sex. Mr. Osburn also observed it in the same island, and has given a long account of its habits. In the house in which he was living at Shettlewood, these Bats swarmed in the roof, and during the breeding-season, his bedroom, situated immediately below, was rendered so offensive by their peculiar odour, that he was compelled to have every window left wide open at night. The Bats passed out from the roof under the eaves, but not unfrequently small parties of them would come in through the windows and take a short flight round the room. A man sent up into the roof brought down four or five quarts of the Bats, all of which proved to be males. These Bats also live in holes in dead stumps of cocoa-nut trees, and Mr. Osburn describes as follows the results of felling one of the stumps thus occupied. He says:—"It was broken into fragments by the fall, and among them a perfect hecatomb of these little Bats, scattered into two distinct heaps, corresponding to a high and a lower storey in the tree. There must have been at least 150 or 200 altogether. The heap which occupied the upper hole were exclusively males; those in the lower, females, in large proportion, though there seemed a male here and there among them." Mr. Osburn's observations thus strikingly confirm those of Mr. Gosse

* In a paper on the group Molossi, Mr. Dobson distinguishes in all twenty-one species of the genus *Nyctinomus*, mostly inhabitants of the Eastern hemisphere. Three species besides the one above described are found in America.

† *Molossus nasutus*.

‡ Mr. Dobson (*Proceedings of the Zoological Society*, 1876) describes nine species of *Molossus*, all from tropical America.

as to the curious habit of segregation on the part of the males of this species, which induced the latter gentleman to give it the name of the Monk Bat. The holes occupied by the Bats contained a great quantity of dust looking like coarse snuff, which proved to consist entirely of fragments of the hard parts of insects. Mr. Gosse appears not to have observed this Bat in houses, but he describes it as living in great numbers together in the hollows of decayed thatch-palms. He had brought to him a large basket containing a number of the Bats obtained from such a tree, and says that, on being uncovered, it "displayed a pretty scene of dusky life. The 'pie' of our infant days, that contained 'four-and-twenty blackbirds' all ready to sing, was nothing to it. Fifty Bats, all alive and kicking, were huddled into the narrow space; an arrangement which, considering their natural propensities, was probably not very disagreeable to them. I examined forty three, a few escaping from the crowd, and if I was surprised before at the extent of their gregarious habits, I was still more surprised to find that of this number every one was of the male sex, as had been the one formerly examined. . . . . As they huddled and crawled over each other they emitted quivering squeaks. They all displayed the extraordinary activity mentioned above, preferring to run rather than fly, though a few took to wing. In climbing, to suspend themselves, they used the thumbs or the hind-feet indiscriminately. In running along the floor, an action which they performed very swiftly, they rested on the wrists, elevating the fore-parts of the body considerably."

THE COLLARED BAT.*

The Mastiff Bats certainly cannot boast of any great attractiveness in their aspect, but they must yield the palm of ugliness to a curious species described by Dr. Horsfield. It is a clumsy, heavy-looking animal, of considerable size for a Bat, measuring more than five inches in length from the tip of the nose to the root of the tail. Its body is entirely covered with a thick black skin, which is absolutely naked on the back, and has only a few short hairs upon the sides of the body, the interfemoral membrane, and the lower surface. The face and lips also have a few fine long hairs, and a curious collar of brown hairs runs round the neck. To add to the charms of the creature, the skin is thrown into thick folds in various parts of the body; the legs are thick, and terminated by clumsy feet, in which the first toe is very large, bristling with long hairs on the outside, and widely separated from the others, so as to acquire very much the character of a posterior thumb; the interfemoral membrane is short, forming a mere band between the legs, from which the tail, which is about half as long as the body, and very thick, projects for about two-thirds of its length. The head is long; the muzzle, which is truncated, projects considerably beyond the lower jaw; the ears are quite separate, triangular, with the tips rounded; the tragus is very small; the wings are long, and rather narrow, and their membrane extends down to about the middle of the shank, but springs from such a level on the sides of the body, that a deep cavity is formed on each side under the armpit, which is converted into a sort of pouch by an extension of the skin of the sides to the lower surface of the upper arm and thigh. In the pouches thus formed, and close to the armpits, the nipples are situated. There are two incisor teeth in each jaw, the upper ones strong, and implanted in well-developed and united intermaxillary bones. The upper jaw has one, and the lower jaw two premolars on each side, and there are three true molars on each side in both jaws.

HEAD OF COLLARED BAT.
(*After Temminck.*)

This hideous Bat was discovered in the peninsula of Malacca, and has since been found in Java, Sumatra, and Borneo. It does not appear to be abundant in its native countries, and its apparent rarity is doubtless increased by its selecting for its residence the wildest and most solitary districts in the heart of the great forests. During the day it usually retreats to the hollow trunks of trees, but sometimes takes its repose in holes in the ground or in clefts of the rocks, coming out soon after sun-down, when it is seen flying heavily about the borders of the woods, or even high up above the forest in the plains.

* *Chrotomles torquatus.*

Another curious but by no means agreeable peculiarity of this species remains to be noticed. Across the base of the neck, immediately in front of the breast, there is a great pouch, formed apparently by a fold of the skin, which receives an oily secretion from a large gland, regarded by Professor Temminck as perhaps analogous to the thyroid. In the male this gland is very broad, and divided into two lobes, and the fluid secreted by it passes into the pouch by a great number of small pores. In the female the apparatus is smaller, but more complicated; the gland is composed of two small lobes, but between these there is a membranous pouch or reservoir, in which the oily fluid seems to become concentrated, forming a brown, granular, fatty matter, which passes into the great throat-pouch through a single large opening. This secretion possesses an odour so strong as to be still perceptible after the animals have been preserved in spirits for several years; and Dr. Salomon Müller states that his artist, M. van Oort, when engaged in making a drawing from a living specimen, was affected with a headache and nausea so violent that he had much difficulty in completing his task. It appears that the fetid fluid gets diffused over the hairs bordering the throat-pouch, and thus readily passes off into the air, and spreads to a long distance round the places inhabited by the Bats, and may thus serve, as Professor Temminck suggests, to enable these creatures to find each other in the dark retreats which they frequent. This would apply to other species which diffuse a peculiar odour, although none of them seem to possess so powerful an odoriferous secretion as the Collared Bat.

COLLARED BAT. (*After Temminck.*)

THE NEW ZEALAND SHORT-TAILED BAT.*

We have already noticed the occurrence in New Zealand of a species of Bat nearly allied to the common Bats of Europe, although differing from them in certain characters which have led to the

* *Mystacina tuberculata.*

formation of a distinct genus for it. The present species, the second known Bat of New Zealand, is a far more remarkable animal; in fact, its characters are so singular that it forms not only a distinct genus, but a peculiar sub-division of the family to which it belongs.

The Short-tailed Bat of New Zealand, which appears to be not of very common occurrence there, is a small Bat, not exceeding two inches and a half in length of head and body; the body is short and broad; the muzzle is greatly produced beyond the opening of the mouth, and terminates in a sort of projecting snout, which carries the nostrils towards the sides of its tip; the ears are quite separate, simple, ovate, and slightly pointed at the tips, and furnished with a long, narrow, and pointed tragus; the wings are rather short and broad, and the middle finger consists of four joints, having three true phalanges; the wing-membranes extend down to the end of the shank; a narrow band of the membrane running from the wrist down the arm, and bordering the side of the body and the leg, the antebrachial or shoulder membrane and the basal part of the interfemoral membrane are thick and leathery, and marked with numerous deep wrinkles on the upper surface. The tail is short, and only a very small portion of it is enclosed in the interfemoral membrane. The dentition is exceedingly peculiar. There are two upper incisors, which are nearly of the same shape as the canines; the lower jaw also has two incisors, but these are small, three-lobed at the tip, and placed in front of the canines, which are of large size, and nearly in contact at the base. There are two premolars and three true molars on each side in both jaws.

HEAD OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proceedings of the Zoological Society.*)

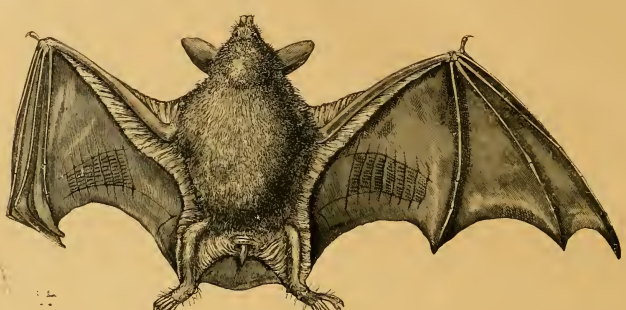
TEETH OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proc. Zool. Soc.*)

The fur is short, crisp, and thick, and extends forward on the head towards the nose, where it is bounded in front by a frill of stiff, upright hairs. On the upper parts of the body the fur is dusky at the base and tipped with a shining greyish-brown, with a slight olive tinge. On the lower surface the hairs are brown at the base, with greyish-brown tips. The membranes are dark-brown, with the wrinkled, leathery portion paler, and of a yellowish tinge. Of the habits of this species nothing has been recorded.

In many respects the New Zealand Short-tailed Bat is exceedingly interesting to the zoologist. In its structure it presents striking resemblances to species belonging to several groups, whilst its own personal peculiarities are very remarkable. These are noticed by Mr. Dobson, from whose valuable writings we have so often had occasion to quote, in a short paper read before the Zoological Society in 1876. He finds that the peculiar leathery and wrinkled portions of the membranes are so arranged that when the wings are folded—which they are in a very complicated manner, and so as to pack away into the smallest possible space—each wing is "tucked in beneath the thickened portion of the wing-membrane margining the fore-arm and side of the body, which sheathes and completely conceals the whole wing. The posterior half of the interfemoral membrane, from the point where the tail perforates it, is rolled upwards and forwards beneath the leathery anterior half." In this way the more membranous parts of the wings are protected, as Mr. Dobson remarks, precisely in the same way that the delicate wings of the Beetles and Bugs are sheltered in repose beneath the hardened elytra. "With the wings and interfemoral membranes thus encased," he adds, "this species is the most quadrupedal of Bats;" and the structure of the limbs indicates that all these arrangements really tend to adapt this animal for progression on all-fours. The thumb is long, and armed with a large, sharp claw, which is remarkable among Bats for having a small sharp tooth near the base, in its concave side, a structure which, from the analogy of a species of Chameleon in which the same thing occurs, is regarded by Mr. Dobson as greatly increasing the clinging power of

THUMB AND FOOT OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proceedings of the Zoological Society.*)

the animal. The hind limbs are short and stout, and the feet remarkably large, and their whole lower surface, including that of the toes, is covered with a soft, loose, deeply-wrinkled skin, that of each toe showing a strong central groove with short grooves at right angles to it, very much after the pattern seen in some Geckos or Wall Lizards. This loose, wrinkled skin is also continued along the flattened lower surface of the ankle and leg. "All these peculiarities of structure," says Mr. Dobson, "must accompany some corresponding peculiarities in the habits of this species. . . . I have no doubt that the denticle at the base of the claw in *Mystacina tuberculata* compensates that species



NEW ZEALAND SHORT-TAILED BAT. (From the *Proceedings of the Zoological Society.*)

exceptionally for the imperfect condition of the fore-limbs as organs of prehension; and this, taken into consideration with the peculiar manner in which the wings are protected from injury when not employed in flying, and with the manifestly adhesive nature of the sole of the foot and inferior surface of the legs, leads me to believe that this species hunts for its insect food, not only in the air, but also on the branches and leaves of trees, among which its peculiarities of structure most probably enable it to walk about with security and ease." This and the Brown Pig Bat (*Thyroptera tricolor*), already described (p. 310), may be regarded as more especially adapted for climbing than any other members of the order Chiroptera.

CHAPTER VI.

FAMILY VI.—PHYLLOSTOMIDÆ, OR VAMPIRES.

Distinguishing Marks of the *Phyllostomidæ* — Location — Diet — Blood-sucking Propensities — Exaggerations of the Older Writers—Testimony of Azara—Darwin's Evidence—Bat-bites—The Witness of Bates, Wallace, Fraser, Prince Maximilian—Conclusion of the Whole Matter—The Desmodonts and Javelin Bat—The Tongue in the Genus *Phyllostoma*—Blainville's Bat—Extraordinary Development of Face and Head—Owl-faced Bat—Javelin Bat—Allied Species—Vampire Bat—Mr. Bates' Testimony to its Inoffensiveness, and Description of its Habits—Neuwied's Large-leafed Bat—Great-eared Leaf Bat—Soricine Bat—Redman's Bat—Sezekorn's Leaf Bat—Spectacled Stenoderm—Jamaican Stenoderm—Desmodus—Dentition—Blood-sucking Propensities—The Bites—Stomach of Desmodus, Frugivorous and Insectivorous Bats—Classification—Concluding Remarks.

We have already seen that the first group of ordinary Bats includes two sets of species, one characterised generally by the possession of dermal complications of the muzzle, the other by the absence of any such arrangements; and in like manner the second alliance has also its simple-nosed and

leaf-nosed forms. Of course, the presence or absence of the nose-leaf can only be regarded as a secondary character; and we have had occasion to show that its mere existence is not sufficient to overrule other important structural peculiarities (as in the genera *Nyctophilus* among the *Vespertilionidæ*, and *Rhinopoma* among the *Emballonuridæ*), but in conjunction with such characters it must be regarded as of great value, especially since its development would seem to be associated, as already pointed out, with that wonderful acuteness of the tactile sense which seems to guide the Bats in their nocturnal wanderings.

In the *Phyllostomidæ*, or Leaf-nosed Emballonurine Bats, this is strikingly the case, and the family may be regarded as an especially well-marked group, distinguished from all other Bats (except the genus *Mystacina*) by the presence of three distinct phalanges in the middle finger. Of these joints the first is short, and bent up in repose along the upper surface of the metacarpal bone, in the manner characteristic of the Bats of this division. The nasal appendages are sometimes rudimentary, but generally exhibit a structure more or less resembling that characteristic of the Horseshoe Bats, the nostrils opening in the fissure between the front-piece, or horseshoe, and true nose-leaf; and the chin is furnished with warts, or erect ridges of skin, reminding us of the same parts in the genus *Noctilio*, which certainly forms a sort of transition between the *Emballonuridæ* and *Phyllostomidæ*. Another character which seems at once to distinguish these Leaf-nosed Bats from those of the first division is the complete development of the intermaxillary bones, which in the *Rhinolophidæ* and *Nycteridæ* are rudimentary, or represented by mere cartilages. The dentition varies very considerably in this family, but in all the species the canines are large and acute, and the molar teeth show either the usual W-shaped cusps, or a sharp, cutting edge, like that found in some carnivorous mammals.

SKULL OF JAVELIN BAT.

The *Phyllostomidæ* are entirely confined to the warmer parts of America. Several of them are of considerable size. The food of some consists of insects; others find their nourishment in fruits; and a good many appear to have the habit of sucking the blood of other animals—an evil practice which has been erroneously ascribed to the species generally, causing them, under the name of Vampires, to be regarded as most formidable animals. As many of the accounts of the blood-sucking propensities of these Bats give no definite clue to the species referred to, and the number of species which seek this form of nourishment, habitually or occasionally, is very doubtful, it may be as well to give a general statement on the subject in this place.

The earliest accounts of the natural history of America contain references to these animals, with a probably somewhat exaggerated statement of the fatal effects of their attacks upon men and animals. Peter Martyr declares that the Bats suck the blood of men and animals while they are asleep, exhausting them to such an extent as to cause death. Piso, Father Jumilla, Don Antonio de Ulloa, and many other writers, express themselves in similar terms, and generally agree in representing the consequences of the bites as very serious.

La Condamine, who travelled in South America in the early part of the last century, confirms the above statements as to these Bats, which, he says, attack man, and even destroy animals. He ascertained that they suck the blood of Horses and Mules, and stated that they had in some places destroyed the cattle introduced by the missionaries.

Azara, in his natural history of the quadrupeds of Paraguay, describes the blood-sucking habits of a species which has been referred to the genus *Stenoderma*. He says:—"I have seen a great number, they were all constantly identical among themselves, but differ from all other Bats in that, when put on the ground, they run nearly as fast as a Rat, and they like to suck blood. Sometimes they bite the combs and wattles of sleeping fowls, and suck their blood, in consequence of which the fowls die, because the wounds mortify. They also bite Horses, Mules, Asses, and horned cattle, usually on the rump, the shoulders, or the neck, because in these parts they find it convenient to cling to the mane or

the tail. Lastly, man is not free from their attacks; and upon this point I can give certain testimony, seeing that they have bitten me four times in the tips of my great toes, when I was sleeping in the open country in huts. The wounds they made without my feeling them were circular or elliptical, from a line to a line and a half in diameter, but so shallow that they did not entirely penetrate my skin, and it could be seen that they were made by removing a small piece, and not by piercing, as might be supposed. Besides the blood which they sucked, I reckon that what flowed away might be half an ounce when I lost most by their attack; but as the effusion in the case of horses and cattle is about three ounces, and the skin of these animals is very thick, it is to be supposed that the wounds are larger and deeper. This blood comes neither from the veins nor from the arteries, seeing that the wound does not extend to them, but from the capillary vessels of the skin, from which the Bats, no doubt, draw it by sucking and licking. Although my wounds were painful for several days, they were of so little consequence that I did not apply any remedy to them."

These statements of Azara's reduce the affair to rather more moderate dimensions than would appear to belong to them from the exaggerated statements of the older writers, which can only be accepted with some allowance for the love of the marvellous inherent in those who have strange things to tell of new countries. But even these less extravagant accounts of the Vampires of South America were regarded in Europe with some feeling of scepticism; and Mr. Darwin appears to have been one of the first reliable naturalists to observe the act of blood-sucking on the part of a Bat of this family, belonging to the genus *Desmodus*. He says ("Journal," p. 25):—

"The Vampire Bat is often the cause of much trouble, by biting the Horses on their withers. The injury is generally not so much owing to the loss of blood, as to the inflammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one was actually caught on a Horse's back. We were bivouacking late one evening near Coquimbo, in Chili, when my servant, noticing that one of the Horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers, and secured the Vampire. In the morning, the spot where the bite had been inflicted was easily distinguished, from being slightly swollen and bloody. The third day afterwards we rode the Horse without any ill effects."

Tschudi, who travelled in Peru, and wrote on the natural history of that country, gives an account of his experience in the matter of Bat-bites. According to him, the blood which the Vampires draw from the wounds inflicted by them on cattle and horses is not more than an ounce or two, but the wound continues to bleed freely for some time; and it is not uncommon in the morning to find the animals attacked in a deplorable state, and bathed in their own blood. He mentions the case of an Indian who went to sleep when intoxicated, and was bitten in the face by a Vampire. The wound, which was small, and apparently of little consequence, was followed by an inflammation and swelling so great that the man's features became quite unrecognisable. In all probability, the condition of his blood after his debauch may have had a good deal to do with the severity of the after-effects of the wound.

Mr. Bates, who during his travels on the Amazon was once wounded in the hip, probably by a Bat, which he describes as a small dark-grey Phyllostome streaked with white down the back, states that it is only a few persons who are subject to be so attacked. His friend Mr. Wallace seems to have had a larger experience in this respect. He ascribes the mischievous propensity to the great Javelin Bat (*Phyllostoma hastatum*), of which he says:—

"This is a common Bat on the Amazon, and is, I believe, the one which does much injury to horses and cattle, by sucking their blood; it also attacks men, when it has opportunity. The species of blood-sucking Bats seem to be numerous in the interior. They do not inhabit houses, like many of the frugivorous Bats, but enter at dusk through any aperture they may find. They generally attack the tip of the toe, or sometimes any other part of the body that may be exposed. I have myself been twice bitten, once on the toe, and the other time on the tip of the nose; in neither case did I feel anything, but awoke after the operation was completed. In what way they effect it is still quite unknown. The wound is a small round hole, the bleeding of which it is very difficult to stop. It can hardly be a bite, as that would wake the sleeper; it seems most probable that it is either a succession of gentle scratches with the sharp edge of the teeth, gradually wearing away the skin, or a triturating with the

point of the tongue, till the same effect is produced. My brother was frequently bitten by them, and his opinion was that the Bat applied one of its long canine teeth to the part, and then flew round and round on that as a centre, till the tooth, acting as an awl, bored a small hole, the wings of the Bat serving, at the same time, to fan the patient into a deeper slumber. He several times awoke while the Bat was at work, and though of course the creature immediately flew away, it was his impression that the operation was conducted in the manner above described. Many persons are particularly annoyed by Bats, while others are free from their attacks. An old mulatto at Guia, on the Upper Rio Negro, was bitten almost every night, and though there were frequently half a dozen other persons in the room, he would be the party favoured by their attentions. Once he came to us with a doleful countenance, telling us he thought the Bats meant to eat him up quite, for having covered up his hands and feet in a blanket, they had descended beneath his hammock of open network, and attacking the most prominent part of his person, had bitten him through a hole in his trousers! We could not help laughing at the catastrophe, but to him it was no laughing matter.

"Senhor Brändão, of Manaquery, informed me that he had once an Indian girl in his house, who was much subject to the attacks of the Bats. She was at length so much weakened by the loss of blood that fears were entertained of her life, if they continued their attacks, and it was found necessary to send her to a distance, where these bloodthirsty animals did not abound.

"The wound made by them is very difficult to heal, especially in its usual locality—the tip of the great toe—as it generally renders a shoe unbearable for a day or two, and forces me to the conclusion that, after the first time, for the curiosity of the thing, to be bitten by a Bat is very disagreeable. They will, however, very rarely enter a lighted room, and for this reason the practice of burning a lamp all night is almost universal."

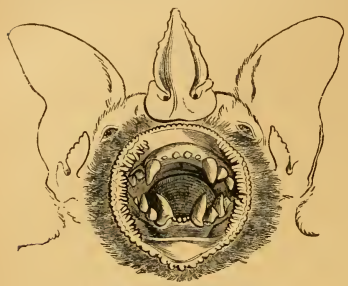
In the island of Muciana, situated in the mouth of the Amazon River, Mr. Wallace had an opportunity of observing the mischief done by these blood-sucking Bats on a large scale. The island is used as a grazing-ground, but some of the horses and cattle on it, says Mr. Wallace, were "miserable-looking objects, from wounds inflicted by the Bats, which cause them to lose much blood, and sometimes, by successive attacks, kill them. Senhor Leonardo informed us that they particularly abounded in some parts of the island, and that he often has Bat-hunts, when several thousands are killed." Mr. Wallace describes the criminal in this locality as a large coffee-brown Bat, probably the *Phyllostoma hastatum*. He adds that they "live in holes of trees, where they are killed in considerable numbers, Senhor Leonardo informing me that they had destroyed about seven thousand during the last six months. Many hundreds of cattle are said to have been killed by them in a few years."

Mr. Louis Fraser, when collecting at Gualaguzia, in Ecuador, obtained a specimen of the Javelin Bat, and was told by the Indian who brought it to him that this species attacks the Mules.

Prince Maximilian of Neuwied also lays the crime of blood-sucking at the door of the Javelin Bat. He says:—"In its stomach I found remains of different kinds of insects, but never any traces of blood that had been swallowed; nevertheless, it is certain that this and many other species of Phyllostomes suck the blood of animals. I have never surprised such a Bat at the moment of sucking, but have observed in the moonshine and twilight how these large animals fluttered, with strongly rustling wings, about our grazing beasts of burthen, which bore their vicinity quietly, but on the following morning were covered with blood, from the shoulders down to the hoofs. On the Rio das Contas we found the cattle quite exhausted with the loss of blood." The same author adds:—"As I have never found blood in the stomachs of the Phyllostomes, this nutriment can only be partaken of by them rarely, and for this reason I do not venture to decide whether some, or all, or what species of them are fond of this food; but with regard to the *largest* species here described, it needs no further confirmation, and I believe that of all the Phyllostomes described by me, it is nearly the only one that sucks blood."

It will be seen from the foregoing statements that there is some uncertainty as to the precise species which may justly be charged with the crime of blood-sucking. The habit has been ascribed to various species, some of which are now known to feed upon fruits, whilst others find their nourishment in the abundant insect population of tropical America; and in the opinion of many zoologists of the present day, the sole criminals are the species of the genus *Desmodus*, a small aberrant group, specially distinguished from all the rest by the structure of their teeth and stomach. Mr. Tomes, in commenting

on Mr. Fraser's statement, suggests that the blood-sucking was performed by the Desmodonts, which accompanied the Javelin Bat in Mr. Fraser's collection, and the guilt transferred to the larger and more striking species; and the same explanation may apply to the accounts given by Mr. Wallace and Prince Maximilian, both of whom apparently charge the Javelin Bat with sanguinivorous proclivities solely upon circumstantial evidence. If this be the case, *Phyllostoma hastatum* must be regarded as a very unfortunate animal. Professor Reinhardt agrees with Mr. Tomes in considering the Desmodonts (*Desmodus* and *Diphylla*) the only blood-sucking Bats, and they appear to be the only forms that have been actually taken in the fact.



MOUTH OF SPECTACLED STENODERM.

At the same time we are perhaps hardly justified in passing a verdict of not guilty in the case of some of the other species, for certain observers record the finding of blood in the stomach, and by others the structure of the mouth is looked upon as furnishing circumstantial evidence of sanguinary propensities. Thus Professor Bell says that the tongue in the genus *Phyllostoma* has a number of wart-like elevations, so arranged as to form a complete circular suctorial disc when they are brought into contact at their sides, which is effected by a set of muscular fibres having a tendon attached to each of the warts. By means of this curious sucker, he adds, these Bats are enabled to suck the blood of animals and the juice of succulent fruits. According to other writers the papillæ which are borne by the lips (see figure), and which seem to have some analogy with the wrinkles occurring on the lips of the Mastiff Bats, serve this same office; and Prince Maximilian especially describes the mode in which the lips in the Javelin Bat may be converted into a sucking-canal. It is to be observed, however, that these papillæ are greatly developed in species which are now known to derive the whole or the greater part of their nourishment from fruits.

HEAD OF BLAINVILLE'S BAT. (*After Peters.*)

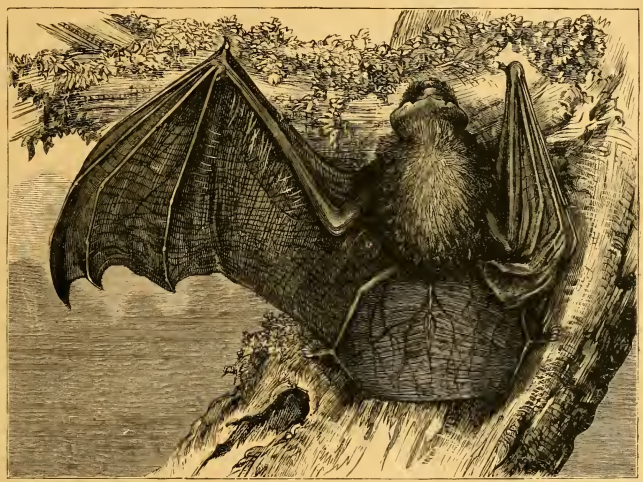
BLAINVILLE'S BAT.*

A most grotesque species of Bat, the position of which has been a subject of some discussion, as it seems to be almost equally related to the *Emballonuridæ* on the one hand, and to the *Phyllostomidæ* on the other, was described many years ago (in 1821) by the late Dr. Leach under the name of *Mormops Blainvillii*. As regards the development of the cutaneous system about the face, this species is without exception the

* *Mormops Blainvillii.*

most extraordinary species of the whole order (see figure). The skull itself is of curious structure, the cranial portion, or that containing the brain, being so much elevated, that its height is nearly equal to the whole length of the skull, and its front wall descends in such a manner as to form nearly a right angle with the bones of the face (see figure). The superficial structures belonging to the face and head are so complicated as almost to defy description, and so grotesque that one might recommend their study to the inventors of demon-masks for pantomimic purposes. The ears are of considerable size, and have their margins notched in several places; they sweep round on the cheek, to terminate at a short distance from the angle of the mouth, and have their inner margins joined by a fold of membrane. The tragus is a thick, more or less lobulated organ. The nostrils are round apertures in the extremity of the snout,

SKULL (*Natural Size*) AND DENTITION (*Enlarged*) OF BLAINVILLE'S BAT.



BLAINVILLE'S BAT. (*After Peters.*)

their margins are raised and naked, and produced above into small lobes. Between the nostrils there is a perpendicular ridge, and above this a small round papilla, on each side of which there is an irregular kidney-shaped elevation. Behind these parts comes a large fold of skin, deeply notched in the middle above, which joins on each side with the middle of the membrane uniting the ears, and probably represents the hinder nose-leaf in some other Bats. The lower lip consists of two leaves, the upper of which forms in the chin a large shield-shaped, warty plate, beneath which the lower leaf and the skin of the throat form a complicated series of lobes.

The teeth in this Bat consist of four incisors and a pair of strong canines in each jaw, two premolars in the upper and three in the lower jaw, and three molars, with more or less distinct W-shaped cusps on each side in both jaws (dental formula—incisors, $\frac{4}{4}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{2-2}{3-3}$ molars, $\frac{3-3}{3-3}$). The wings are well developed, long, and broad, and the membranes descend to the

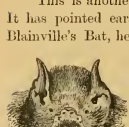
ankles (see figure); the first phalanx of the middle finger is very short. The interfemoral membrane is ample, and stretched by two very long heel-spurs; it is perforated before the middle for the passage of the tail, about one-third of which projects on the upper surface of the membrane.

The length of the head and body in this species is about two inches and two-thirds, and that of the tail from one inch to one inch and one-sixth, according to the sex, being longer in the male. The fur of the upper side is of a rich umber-brown, and that of the lower surface brownish-grey, the difference being caused by the brown tips of the hairs above, which are wanting on those of the under side. The hairs on the inner margin of the ear are shiny brown. The membranes are dark-brown. This species is an inhabitant of South America and of the West Indies, but it does not seem to be very abundant. Nothing has been recorded as to its habits, but it is probably a strictly nocturnal Bat.

Blainville's Bat is the type of a small group of *Phyllostomidæ*, which, as already indicated, form a sort of transition towards the more normal *Emballonuridæ*, the line of relationship probably passing through the *Noctiliones*. This group (*Mormopes*, Peters; *Lobostominæ*, Dobson) is characterised by its terminal nostrils, and the cutaneous folds or ridges on the chin.

THE OWL-FACED BAT.*

This is another species of the *Mormops* group, but very much less remarkable in its characters. It has pointed ears, with an elongated tragus. The hinder nasal appendage, which is so large in Blainville's Bat, here forms merely a sort of transverse pad across the middle of the muzzle, and the nostrils are pierced in the middle of the upper part of a naked piece, which rises directly from the upper lip. The lower lip is warty, but the warty portion gradually passes into the other part of the lip, and below it there is a thin fold of skin. The skull is considerably longer than high; and while the teeth are present in the same number as in *Mormops*, the second premolar in the lower jaw is small, and removed inwards from the line of the series of teeth.



HEAD OF OWL-FACED BAT.
(From *Gosse's "Jamaica."*)

The Owl-faced Bat is a small species, the head and body measuring only two inches. The tail is an inch long, and about a fifth of it projects from the upper surface of the interfemoral membrane, which is expanded by a pair of very long spurs. The expanse of wing is nearly twelve inches, which is very great for so small a Bat. The body is covered with a short, soft fur, of a brownish-grey colour above, and pale-grey beneath; the membranes are black.

The Owl-faced Bat was originally obtained from Cuba, but it has since been captured in St. Domingo and Jamaica, and may probably occur elsewhere in the West Indies, or on the continental part of Central America. Mr. Gosse, when in Jamaica, captured a specimen which flew in at an open window, but did not allow itself to be taken until after a very tedious pursuit, in which it manifested great agility on the wing. He says that "in captivity it uttered once or twice, very slightly, the peculiar short sound resembling the *clicking* of some delicate piece of machinery, which every one who is familiar with living Bats will remember as common to most of these animals. It was very active, leaping up to flight from the table, and expanding the wings in a moment, though confined within a candle-shade. It bit fiercely at the hand that held it, but could not draw blood from the fingers. It usually carried the apical half of the interfemoral bent upward at the point where it ceases to embrace the tail, so that the tail seems to extend beyond the membrane. It is thus held by the calcanea, the tips of which, curving downward, carry down again the tip of the membrane, puckered into minute plicæ."

Another species of this genus, *Chilonycteris Parnellii*, inhabits Cuba and Jamaica, and two others, *C. personata* and *C. rubiginosa*, occur in Brazil, and extend thence to Central America.

Another allied form is Davy's Bat (*Pteronotus Davyii*), which is remarkable for having the wings attached along the course of the spine, as in the Pteropid genera *Cephalotes* and *Notopteris* (see pp. 277, 278).

* *Chilonycteris Macleayii.*

THE JAVELIN BAT.*

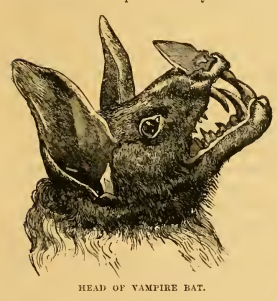
In the genus *Phyllostoma* the nasal appendages are well developed; there is a distinct horseshoe-shaped piece in front, and above the nostrils rises a large lance-shaped leaf. The middle of the lower lip shows a triangular naked patch with warty margins. The ears are of moderate length and quite separate; the tail is much shorter than the interfemoral membrane; and the first phalanx of the middle finger is less than half the length of the metacarpal bone. There are, as usual in this family, four incisors in each jaw; the canines are large and powerful, and the lower jaw has only two premolars on each side. The true molars are well developed, and show strong W-shaped cusps.

HEAD OF JAVELIN BAT.

The Javelin Bat, which lives in all parts of tropical America, and also occurs in the West Indies, is a large species, measuring more than five inches in total length, and nearly twenty-three inches in expanse of wing. Its fur is usually of a uniform brown colour; its ears of moderate size, somewhat pointed, strongly excavated on the outside below the apex, and with a lance-shaped tragus; the short tail extends about one-third of the length of the interfemoral membrane, which is stretched straight across between the long heel-spurs.

We have already referred at some length to the habits of this species in connection with the charge of blood-sucking that has been brought against it, and stated that when examined only remains of insects are found in its stomach. It is described as having a lofty and powerful, although not rapid flight. These Bats frequently make their way into rooms through the open windows, when they fly about rather noisily. In the neighbourhood of houses they sleep during the day among the leaf-stalks of the cocoa-nut palms; in the open country they resort to the hollow trunks of trees.

Numerous species nearly allied to this occur in Brazil and other parts of America, such as *Phyllostoma discolor* and *elongatum*, *Mimon Bennettii* and *megalotis*, in which the chin bears two warts separated by a furrow; *Tylostoma Children* and *crenulatum*, with only two lower incisors; *Carollia brevicauda*, in which the middle of the horseshoe is scarcely distinct from the upper lip; *Rhinophylla pumilio*, in which the tail is entirely wanting; and *Phylloderma stenops* with three instead of two premolars on each side in the lower jaw.



HEAD OF VAMPIRE BAT.

THE VAMPIRE BAT.†

The genus *Vampyrus* differs from *Phyllostoma* and its allies (except the last) by the presence of three premolars on each side in the lower jaw. The lower lip has two broad warts separated by a furrow; the ears are large and separate; the first joint of the middle finger is more than half as long as the metacarpal bone; and the tail is altogether wanting. The nasal appendage has the horseshoe part well developed, with the margin free and quite distinct from the upper lip.

The Vampire, which was one of the earliest known species of these American Bats, and is also the largest of all, is by no means an amiable-looking animal. Its head is considerably elongated: the nose-leaf is long and pointed; the wings reach the base of the outer toe, and the middle of the hinder margin of the interfemoral membrane projects in a little point, although, as already stated, there is no tail to cause any such projection. The fur, which is long and soft, is usually chestnut-brown above and pale beneath. The length of the head and body in this Bat is about five and a half inches. From

* *Phyllostoma hastatum.* † *Vampyrus spectrum.*

various considerations, no doubt in part from its large size and ugliness, this Bat has always been regarded as one of the most noxious of the blood-suckers of its family, and, in fact, it owes its name of Vampire to the belief in its sanguinary nature. But Mr. Bates, who certainly had good opportunities of observing it, acquits the Vampire of this charge. In describing his residence at Ega, on the Upper Amazon, he says :—"The Vampire was here by far the most abundant of the family of Leaf-nosed Bats. It is the largest of all the South American species, measuring twenty-eight inches in expanse of wing. Nothing in animal physiognomy can be more hideous than the countenance of this creature when viewed from the front; the large leathery ears standing out from the sides and top of the head, the erect spear-shaped appendage on the tip of the nose, the grin, and the glistening black eye, all combining to make up a figure that reminds one of some mocking imp of fable. No wonder that imaginative people have inferred diabolical instincts on the part of so ugly an animal. The Vampire, however, is the most harmless of all Bats, and its inoffensive character is well known to residents on the banks of the Amazons. I found two distinct species of it, one having the fur of a blackish colour, the other of a ruddy hue, and ascertained that both feed chiefly on fruits. The church at Ega was the head-quarters of both kinds. I used to see them, as I sat at my door during the short evening twilight, trooping forth by scores from a large open window at the back of the altar, twittering cheerfully as they sped off to the borders of the forest. They sometimes enter houses. The first time I saw one in my chamber, wheeling heavily round and round, I mistook it for a Pigeon, thinking that a tame one had escaped from the premises of one of my neighbours. I opened the stomachs of several of these Bats, and found them to contain a mass of pulp and seeds of fruits, mingled with a few remains of insects. The natives say they devour ripe cajús and guavas on trees in the gardens; but, on comparing the seeds taken from their stomachs with those of all cultivated trees at Ega, I found they were unlike any of them; it is therefore probable that they generally resort to the forest to feed, coming to the village in the morning to sleep, because they find it more secure from animals of prey than their natural abodes in the woods."

The two forms referred to by Mr. Bates in the above extract were probably only colour varieties of *Vampyrus spectrum*, but several nearly related species occur in tropical America. Thus, *Chrotopterus auritus* differs from the preceding only in having a short tail like that of *Phyllostoma*, and the second lower premolar small, and placed within the line of the teeth; *Lophostoma sylvicola*, *amblyotis*, and *bidens*, all from Brazil, have the second lower premolar small, but in the row, the horseshoe only developed at the sides, the lower lip as in *Phyllostoma*, the first phalanx of the middle finger a little shorter than the metacarpal, and only two incisors in the lower jaw; *Schizostoma minutum*, *elongatum*, and *Behnii*, whilst agreeing with *Lophostoma* in the proportion of the first phalanx of the middle finger, have the horseshoe and lower lip as in *Vampyrus;* and *Trachyops cirrhosus* has the lower margin of the horseshoe indistinct, the lower lip with a double row of warts and a deep furrow, and the second lower premolar very small, and placed within the line of the row of teeth. These Bats are all inhabitants of the tropical parts of America.

Neuwied's Large-leafed Bat (*Macrophyllum Neuwiedii*) is one of the few species of the present family in which the tail is respectably developed. The ears are of moderate size and separate; the horseshoe is well developed, and the nose-leaf very long, lance-shaped, and pointed. The dentition is as in *Phyllostoma*. This is a small Bat, measuring only about three inches and one-sixth in total length, of which the tail occupies one inch and one-third. The fur is of a sooty-brown colour, paler beneath; the nose-leaf is darker, and the membranes lighter in colour than the body; the interfemoral membrane has about half a dozen curved lines of small dark points towards its apex. Neuwied's Bat was discovered by Prince Maximilian in Brazil in the forests of the banks of the Moucouri River. He describes it as not very abundant, and as passing the day clinging to rocks and the trunks of trees. Its stomach contained remains of insects.

The Large-eared Spear-nosed Bat (*Lonchorhina aurita*), an allied species with a long tail and a very long nose-leaf, is a native of the West Indies. The tail traverses the interfemoral membrane in the fashion of that of a Vespertilionid Bat. The nose-leaf has a distinct rib running up its middle, and at its base there is a deep pit divided into two by a partition on each side of which are the nostrils, and the place of the horseshoe is taken by a curious three-leaved process which stands out in front of the nostrils.

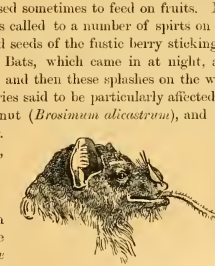
THE GREAT-EARED LEAF BAT.*

The Great-eared Leaf Bat, an inhabitant of St. Domingo and Jamaica, is the type of a remarkable little genus, characterised by having the ears very large, membranous, and united at the base by a membrane; the nasal appendage erect; the interfemoral membrane large, cut out behind in a broad curve running from the tip of one spur to the other; and the tail long, projecting by its last joint beyond the interfemoral membrane. The head is rather long, and the jaws armed with four incisors in each—the intermediate ones in the upper jaw being larger than the lateral—two premolars in the upper, and three in the lower jaw, and three true molars in each jaw. The species of this genus occur in the West Indies, Mexico, and California.

The Great-eared Leaf Bat (*Macrotus Waterhousii*) is a small species, the head and body measuring two inches and a half in length, and the tail one inch and one-sixth. Its fur is of a mouse-colour, paler beneath, and the nose-leaf is lance-shaped.

Our knowledge of the habits of this Bat is chiefly derived from observations made in Jamaica by Mr. Gosse and Mr. Osburn. The former says that it is one of the commonest of the Jamaica Chiroptera, and that it is more addicted than any other species to visiting lighted rooms at night. Mr. Osburn obtained it in abundance from caves; and he adds that although it occurs in houses, it there always inhabits the cellars, and is never found in roofs. The great breadth of the wings gives it during flight an appearance of being larger than it really is, and its flight, according to Mr. Gosse, is not so noiseless as in Bats generally, but accompanied by an audible rushing sound. When on the ground, it makes no attempt to crawl, but springs at once into the air, and takes flight as readily as a bird. Mr. Osburn obtained many females with their young, and describes the mode in which the latter adhere to their mothers. He says the nipple was held by the little hooked teeth of the young animal, while the fur, or even the thigh of the opposite side, was grasped by its feet, so that the young Bat lay diagonally across its mother's belly. The food of the Great-eared Leaf Bat consists for the most part of insects. Mr. Osburn found in the stomach of one a yellowish mass, with fragments of the hard parts of insects, among which were two short legs with strong claws, which probably belonged to some species of Orthoptera.

From one observation it would appear that this Bat is supposed sometimes to feed on fruits. Mr. Osburn says that at Mount Pleasant, St. Ann's, his attention was called to a number of spirts on the wall in an open verandah, on examining which he says he detected seeds of the fustic berry sticking to the wall. He was informed that they were produced by these Bats, which came in at night, and hitched themselves up, when a chewing might be distinctly heard, and then these splashes on the wall. One let the legs and wings of a large Grasshopper drop. The berries said to be particularly affected by these Bats were those of the fustic (*Morus tinctoria*), the bread-nut (*Brosimum alicastrum*), and the rose-apple (*Eugenia jambos*), all of which are mentioned by Mr. Osburn as favourite articles of food with *Stenoderma perspicillatum*, a true fruit-eating Bat.†



HEAD OF SORICINE BAT.

THE SORICINE BAT.‡

Agreeing with the Phyllostomes and Vampires in the form of the molar teeth, the general form of the muzzle, the presence of a nose-leaf and tragus, and some other characters, the *Glossophagæ* exhibit some striking peculiarities which serve to distinguish them from these and all other Bats. Foremost among these is the structure of the tongue, which is very singular. It is a long, somewhat compressed fleshy cylinder beset with reversed hairs, and capable of being pushed out of the mouth to a considerable distance. In the fresh state, according to Rengger, it has a furrow running along the upper surface, and this, he thought, rendered it specially applicable to the purpose of sucking blood, which was formerly supposed

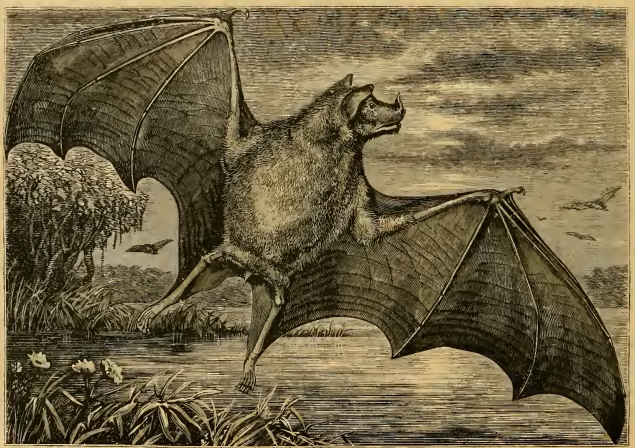
* *Macrotus Waterhousii*.

† Other known species are *Macrotus californicus* and *M. mexicanus*, the native countries of which are indicated in their specific names.

‡ *Glossophaga soricina*.

to be a habit of all these Bats. The lower lip is cleft, and the margins of the fissure furnished with warts, a construction which also contributed to raise a suspicion of the sanguinary habits of the animals. The horseshoe-shaped part of the nose-leaf is very imperfectly developed, and the organ consists chiefly of the lance-shaped leaf; there are four incisor teeth in a close row in each jaw, the two middle ones in the upper jaw larger and broader than the others; the upper jaw has two and the lower three premolars on each side, and there are three true molars on each side in both jaws.

The Soricine Bat has received a great number of names; at least, numerous supposed species founded upon slight differences of colour, &c., are regarded by Professor Peters as all referable to the species described by Pallas, in 1766, under the name of *Vespertilio soricinus*. It is a small Bat about two inches and a quarter long including the tail, which measures about one-sixth of an inch, and is



REDMAN'S BAT. (From the *Proceedings of the Zoological Society.*)

enclosed within the interfemoral membrane. The ears are of moderate size and separate, with small, pointed tragi; and the body is clothed with a rather long, soft, and thick fur, usually of a rusty greyish-brown colour, paler on the lower surface. This Bat inhabits the whole of the warmer part of South America, extending from the Brazilian coast to the Andes, and northwards into Venezuela and Guatemala. It is said to feed chiefly on insects, but probably, like the following species, diversifies its food by eating succulent fruits, this being apparently the purpose for which these animals are endowed with their peculiar tongue.

REDMAN'S BAT.*

The genus *Monophyllus* is nearly allied to *Glossophaga*, but has the incisor teeth in pairs, and the lower ones exceedingly small. The interfemoral membrane forms a narrow border running up the legs, and crossing from side to side; and the tail, although short, projects beyond the membrane. The teeth are—incisors, $\frac{2-2}{2-2}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{2-2}{3-3}$, molars, $\frac{3-3}{3-3}$. The only known species is

* *Monophyllus Redmanii.*

Redman's Bat (*Monophyllus Redmanii*), in which the head and body measure about two inches and one-sixth in length. The expanse of wing is about twelve inches; the fur, which is thick, soft, and glossy, is greyish-brown above with the tips of the hairs slightly hoary, and dusky grey tipped with greyish-white on the lower surface. The membranes are dark brown. This species occurs in Jamaica and Cuba.

It was found by Mr. Osburn at Cairo, in Jamaica. He describes it as exceedingly fierce, drawing blood readily from the back of the hand of its captor. Its activity was beyond anything he had seen in Chiroptera. It ran round the box in which it was placed by a series of little jumps, with almost the quickness of a Mouse, and jumped with the agility of a bird. "On placing it under a glass," he says, "after its first efforts had a little subsided, I saw its tongue projected very rapidly to the board. It seemed to me to be using an additional sense to ascertain the nature of the unusual substance on which it was resting. It frequently stretched its neck and head upwards, the nose-leaf and round ears in motion, as if trying to ascertain whether there was an aperture above, its bright little eyes piercing with eagerness, and panting like a Mouse." Mr. Osburn's observations on the specimens which he had in captivity seem to lead to the conclusion that this Bat feeds on soft fruits, and that its long and peculiar tongue is employed in sucking up their pulp.

Ischnoglossa nivalis has the incisors in pairs and no tail. The described specimen was obtained near the snow line on the Pic d'Orizaba, in Mexico.

SEZEKORN'S LEAF BAT.*

The genus to which this Bat belongs is distinguished from all the preceding ones in the group of *Glossophaga* by the absence or imperfection of the zygomatic arch in the skull. In its dentition it resembles *Glossophaga*. The interfemoral membrane is merely a narrow border round the legs, and the calcaneal spurs are very short, or altogether wanting. There is a very short tail, which, however, projects beyond the interfemoral membrane; the nose-leaf is extremely short, or, indeed, almost rudimentary; and the tongue is very long, pointed, and armed at the sides towards the tip with acute spines turned backwards. This species was discovered in Cuba; it occurs also in Jamaica.†

In the latter island Mr. Osburn found it inhabiting a cave in immense numbers, flying about and swarming on the roof and walls like Bees in a hive. The floor of the cavern was covered with bread-nut kernels and munched berries of the clammy cherry (*Cordia collocasia*). The Bat chirps and squeaks like a bird.

Mr. Osburn describes its manners in confinement as follows:—At first the Bats were restless and fierce, biting violently. When exhausted and quiet he gave them water, which "they drank eagerly, protruding the tongue—the lip hollowed spoon-shape, and the bristles evidently taking up a great quantity." The fruit of the clammy cherry being offered to them, they took no notice of it until Mr. Osburn thought of breaking the skin, when the one he presented it to at last seemed to understand the position of affairs, and licked at it vigorously. "The tongue," says Mr. Osburn, "was rapidly protruded and drawn in again, and the juice and softer pulp cleared away with great rapidity. I noticed that he was very particular in cleaning out the bit of loose skin of the berry, and licked my fingers of the juice spilt on them, carefully cleaning out any that had collected under the nail. The sensation was not at all unpleasant, the tongue feeling soft and spongy, with a slight scratching from the bristles. I then got another berry. The Bat was hanging from the edge of the box, its ventral surface against the side; and as I held the berry a little off, so as to see the action of the tongue, it had, whilst feeding, to bend the neck, so as to raise the head a little. This seemed to fatigue it. It therefore raised itself on one wrist, and turned round, so that its back was against the box's side; but as it did not change the position of the feet, of course the legs crossed. . . . . In this odd position it seemed perfectly at ease, and went on licking at a fresh berry with great relish. . . . . It seized it with its teeth savagely, and then shifted it to one side of the mouth, so that the long sharp canines of one side and the blunt molars held the berry. . . . . This left room for the tongue still to be protruded; for from the arrangement of the minute lower incisors in a concave, the molars can be nearly closed, so as to

* *Phyllonycteris Sezekornii.* † Poey's Leaf Bat (*Phyllonycteris Poeyi*) is a second species inhabiting Cuba.

hold an object, and the tongue still have room for protrusion. The little body trembled with the eagerness of his actions. As the pulp and juice it could thus reach became exhausted, I expected it would drop it; but, to my surprise, it brought up the wrists to the muzzle, took the berry between them, gave it two or three energetic bites, and then held the berry off. So I now understood what the long thumbs were for; for they applied themselves dexterously to the berry, held it firmly, and then, as it appeared to me, by a reverse action of the two wrists, the berry was turned round, a fresh hold taken by the teeth, and the same licking process renewed, till the seed in the centre was cleaned of the pulp, all but the little bit which served for the last tooth-hold. It was then dropped, and the eager little muzzle raised for more. I supplied another, and soon I had a little heap of seeds, exactly like those I found in the cave." This account is particularly interesting, and gives us a clear idea of the proceedings of these curious Bats. Mr. Osburn remarks that the Bats when holding the berries greatly reminded him of Monkeys, and on placing them among the twigs of the cherry, their climbing habits seem to have increased the resemblance.*

THE SPECTACLED STENODERM.†

A peculiar group of this family is formed by the genus *Stenoderma* and its allies. In these Bats the muzzle is short, and the molar teeth do not show the W-like pattern characteristic of the preceding forms, but generally have some sharp points and a cutting edge on the outside. The tail, when present, is very short, and the interfemoral membrane is deeply cut out behind, so much so in many cases as to form a mere narrow border to the legs. The nasal appendages consist of a lance-shaped leaf springing from the middle of a regular horseshoe; and the ears are separate, and furnished with a tragus. The Stenoderms have been divided by authors into several genera, but the characters upon which these are founded are for the most part so minute and uncertain that it would be a mere waste of time to attempt to give them here.

The Spectacled Stenoderm (see p. 264) is one of the best-known species of this group, and inhabits the larger islands of the West Indies, such as Cuba, St. Domingo, and Jamaica, as well as the continental regions of Guiana and Brazil. It is a large species, measuring from four inches to four inches and a half in length, and from sixteen inches to twenty inches in expanse of wing. Its fur is brown, and there is a whitish arch above each eye. The nose-leaf, although lance-shaped, is somewhat oblong in its form, having the sides nearly parallel for some distance; and the wing-membranes are black. There is no tail. The species belongs to the sub-genus *Artibeus*.

This species usually inhabits caves and recesses in the rocks, in the former case generally keeping near the mouth of the cave; but when the geological structure of a district is unfavourable for the formation of caves, it takes up its abode during the day under the fronds of the cocoa-nut palm. At Aquatta Vale, in Jamaica, Mr. Osburn found these Bats clustering on the cocoa-nut trees so thickly, and in such numbers, that a single shot brought down twenty-two, while many others flew off, and took refuge in neighbouring trees. The food of this species consists of various fruits, the seeds and kernels of which are seen in abundance on the floors of the places where they repose during the day. Mr. Osburn mentions the bread-nut (*Brosimum*), the negro-cherry (*Cordia collococca*), the mango, and the rose-apple (*Eugenia jambos*), as fruits upon which it feeds in Jamaica. He also obtained from the intestines of several specimens numerous small seeds, which he believed to be those of the fustic (*Morus tinctoria*). The same observer noticed a curious habit of the species when alarmed—the little

* The rest of the species forming the group *Glossophaga* have three premolars on each side in each jaw, and the inner upper incisors smaller than the outer ones. The lower incisors are more or less deciduous, and sometimes altogether wanting in the adult. *Lonchoglossa caudifera* has a well-developed zygomatic arch, and the interfemoral membrane, tail, and spurs very short. It is from Western Brazil and Surinam. The tail in this species is liable to be withdrawn, or lost in preparing the skin of the animal, and hence it has been described under the rather contradictory names of *caudifera* and *caudata*, and a distinct genus (*Anura*) was established upon the apparently tailless specimens. In *Glossonycteris lesiopyga* the zygomatic arch is deficient, and the tail is wanting; the spurs and interfemoral membrane are very short, and the latter is covered with hair. It is an inhabitant of Mexico. *Choronycteris mexicana*, from Mexico, and *C. minor*, from Surinam, have a well-developed interfemoral membrane enclosing a very short tail. The anterior molars are very narrow, and the first upper premolar is deciduous.

† *Stenoderma perspicillatum*.

round ears were kept in a state of rapid motion, but alternately, so as to produce an effect like that of a person rolling his eyes different ways. The nose-leaf was also slightly moved.

THE JAMAICAN STENODERM.*

This is very nearly allied to the preceding species, from which it differs in its smaller size, being only about two inches and a half long, and in the form of the nose-leaf, which is lance-shaped, with regularly curved margins. It varies considerably in colour, but is usually of various shades of brown.

Mr. Gosse observed the habits of this and the preceding Bat in Jamaica, and describes them as exhibiting a special partiality for the fruit of the *Achras sapota*, called in Jamaica the naseberry, a preference already observed by Mr. A. Ricord in the case of the Spectacled Stenoderm. Mr. Gosse says:—"About a quarter of an hour after the sun has disappeared, and while the western horizon is yet glowing with those effulgent peak-like clouds which only a tropical sunset displays, we discover, by attentively watching the tree, the Bats begin to visit it. First one comes, takes a rapid flight around the tree, darts once or twice through the dense foliage, and winging away is lost in the light of the sky. Another and another comes immediately, and performs the same evolutions; and as the glory of the west fades away to a warm ruddy brown, like the blush of a mulatto girl, many dusky forms are discerned flitting round and round. By carefully following the flight of an individual with the eye, we perceive that now and then he alights for a moment on some object at the extremity of a bunch of leaves; but no sooner has the eye rested on the spot than the sooty wings are again spread, and he is pursuing his giddy course with his fellows. The object of his attention is a ripe naseberry, nestled in the midst of that rosette of leaves. Occasionally the weight of the suspended Bat dislodges the ripe fruit, and it falls to the ground, splitting with the shock. On picking it up, we see that it has been just bitten, not gnawed, as by the rodent incisors of a Mouse, but nibbled in a ragged manner. Though the Vampires often eat the fruit on the tree in this manner, detaching minute morsels, and again and again returning for more, it appears that not seldom they succeed in tearing out a large piece, which they carry away; for fragments of naseberry of considerable size, partly eaten by a Bat, are frequently found at the distance of half a mile from the nearest naseberry tree, dropped on the high road." Mr. Gosse adds that this Bat also feeds on the rose-apple, and Mr. Osburn describes it as consuming all the same fruits as the preceding species.†

THE DESMODUS.‡

The Desmodonts are in some respects among the most remarkable forms of Bats; indeed, their characters are so peculiar that it may be a question whether they ought not to form a distinct family in the order Chiroptera. By some zoologists, indeed, this course has been adopted, but as they agree

* *Stenoderma jamaicense.*

† Two other species of Stenoderms are referred to *Artibeus* by Professor Peters, namely, his *A. fallax* and *A. concolor*, both from Surinam. Both these have five molar teeth in the upper jaw, the preceding species having only four on each side. Three other species forming the sub-genus *Dermanura*, with only four molars on each side of both jaws, are *Artibeus cinereus* and *quadrivittatus*, from South America, and *A. toltecum*, from Mexico. *Phyllops albomaculatus*, from Cuba and Jamaica, and *P. personatus*, from Brazil, have five molars on each side in both jaws, and the palate is deeply cut out between the molars. In *Vampyropa lineatus* and *rittatus*, both South American species, the number of molars is also five, but the palate is not so deeply cut. The typical species of the genus *Stenoderma*, *S. rufum*, resembles this, but has only four molars on each side in each jaw, as described by Geoffroy, but this may be due to the youth of the specimen. *Vyoderma bilabiatum* and *Ametrida centurio* also have only four molars on each side, and the hindmost of these is very small. In the latter the face is much flattened. *Chiroderma villosum* and *pusillum*, on the contrary, have the fourth or hindmost molar larger than any of the rest, and are further characterised by a broad fissure which runs up from the aperture of the nose to the space between the orbits. *Sturnira lilium* and *chilensis* have five molars on each side, and no interfemoral membrane. The former is from Brazil and Paraguay, the latter from Chili. *Brachyphylla cavernarum*, a curious Bat from caves in the islands of St. Vincent and Cuba, which is also said to occur in South Carolina, has an oval nose-leaf surrounded behind by a pit, a triangular fissure in the lower lip, and a rudimentary tail; and the singular genus *Centurio*, including two species (*C. senex* and *McMurtrei*), found in the West Indies and Central America, has a big, Bull-dog-like head and a flat face covered with naked cutaneous leaves. The teeth in *Centurio* resemble those of the Spectacled Stenoderm. There is no tail, and the wing membranes display peculiar translucent patches.

‡ *Desmodus rufus.*

with the Phyllostomidæ in the presence of nasal appendages, and in the possession of three phalanges in the middle finger, we have preferred to leave them in that family, at the same time indicating their striking divergences from all its other members.

The dentition in these Bats is most singular, and as we shall see, its peculiarities are so associated with the exceptional habits of the animal, as to have far greater weight in the question of classification than we have accorded to the dental characters in other families. In fact these peculiarities, in combination with certain points of internal anatomy, are so remarkable that Professor Huxley has suggested the formation for the Desmodonts of a distinct group (*Hæmatophilina*) of the Microchiroptera, which he apparently regards as equivalent in classificational value to all the rest of the sub-order taken together.

SKULL OF DESMODUS.

The remarkable conformation of the teeth will be easily seen by reference to the annexed figure. The upper incisor teeth, four * in number in the young animal, become reduced to two in the adult, but these are of enormous size, prominent, triangular, and very sharp. The lower incisors, on the contrary, are small and have a two-lobed crown. The canines of the upper jaw are nearly of the same form as the incisors, but rather smaller; those of the lower jaw present no remarkable peculiarity. The molar series of teeth, however, are most peculiar—there are two in the upper and three in the lower jaw, but the whole of them are small, compressed, sharp-edged, and furnished with only a single root, thus presenting the characters of premolars, as which, indeed, they are regarded by some writers. If this view of their nature be correct the Desmodonts have no true molars.

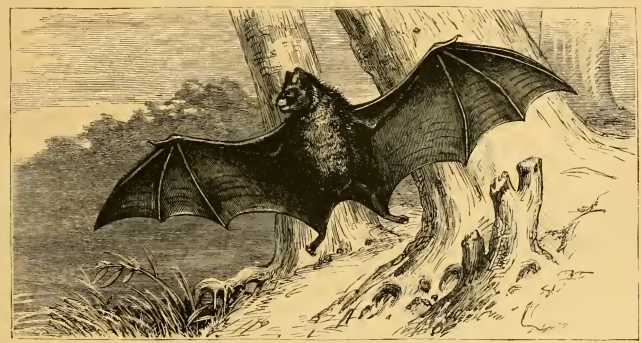
In general characters these Bats approach the Stenoderms. The tail is entirely deficient; the interfemoral membrane forms a mere border to the legs; the ears are of moderate size and furnished with a small tragus; and the nasal appendage consists only of the part analogous to the horseshoe in other genera, the upper leaf being absent. The thumb is very long and strong. The only species of the genus *Desmodus* (*D. rufus*) measures about four inches in length, and some fifteen or sixteen inches in expanse of wing. The fur varies considerably in colour, but generally shows various tints of brown, from a reddish-brown, as in the specimen originally described by Prince Maximilian, through a plain brown, to ashy-brown and mouse-colour, variations which have induced zoologists to describe several distinct species, now, however, generally regarded as identical. This species in its various forms seems to be very generally distributed in all the warmer parts of South America, from Chili to Guiana. As already stated, it appears to be the only species that has been detected in the act of blood-sucking; and by some of the most recent authorities it and its near ally, *Diphylla ecaudata*, are believed to be the only South American Bats which are really guilty of that atrocity.

Dr. Hensel, who has discussed this matter at some length, in connection with his observations on the Bats of Brazil, remarks that the teeth of most of the Phyllostomidæ are like those of the true Carnivora, and the wounds inflicted by them, as may easily be observed by the captor of one of them, are of the same kind as those produced by the teeth of a small Carnivore. In the latter, as he says, there is no loss of substance; the bite consists usually of four punctures, where the canine teeth have pierced the skin, and severe bleeding occurs only when these teeth have penetrated to some depth, and injured one or more of the larger vessels.

But the wounds observed on Horses or Mules that have been bitten by blood-sucking Bats are, as already stated, of quite a different character. They form small oval surfaces, which are but slightly sunken, the surface of the cut not being perpendicular to that of the spot bitten, as would be the case in wounds produced by long canine teeth, but in a general way parallel to it. A similar wound would be produced by lifting a small portion of skin by means of a pair of forceps, and then passing a knife along the surface of the skin, as if to shave it, but so as to cut away the raised portion. By a cut or bite of this kind, notwithstanding its being so superficial, a portion of substance is always lost, a great number of fine cutaneous vessels are cut through, and an abundant and long-continued bleeding is

* According to Professor Gervais; some zoologists make the number of incisors in the first dentition six. The first teeth differ entirely in character from those of the adult animal.

caused.* Such wounds, says Dr. Hensel, can be produced only by large, peculiarly shovel-like, and very sharp incisor teeth, and such teeth occur only in the allied genera *Desmodus* and *Diphylla*. With the latter he had no acquaintance, but he obtained *Desmodus rufus* in abundance. He says it usually lives in cavities in the rocks, but sometimes in large hollow trees. "In capturing these animals," he adds, "I have often had the opportunity of observing the wounds that they inflicted on the noses of my Dogs which tried to seize them, or on my own hands, and found that they perfectly resembled those of the Horses bitten by the blood-suckers. The creatures bite with the rapidity of lightning, and even when they seem merely to touch the skin, a piece of it is found to be deficient. They cannot therefore hold fast with their teeth, as all other Phyllostomidæ do, for these, when they are captured, in their rage seize with their teeth any object within their reach, and hold it for some time." It would appear, especially from the rudimentary state of their molar teeth, that these Bats cannot be supposed to prey upon insects, no remains of which have ever been found in their stomachs, and



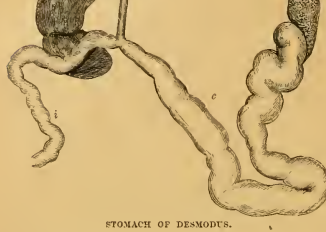
DESMODUS.

their excrements consist solely of a black, pitch-like paste, evidently digested blood. This is evacuated near the entrance of the caves in which the creatures live, and while they are waiting until the darkness outside is sufficient for them to start on their piratical excursions. The floor at such a place is found covered with a layer of the above-mentioned black mass, which may attain a thickness of a foot or more. Dr. Hensel mentions that a large Dog, after paying a visit to one of the caverns haunted by these Bats, looked as if he had got long black boots on. The same writer is of opinion that the Bats must obtain the greater part of their food by capturing and sucking the blood of the smaller warm-blooded animals. As the large domestic animals are not indigenous to America, it is probable that they only furnish an occasional meal to some of the great swarms of these Bats that infest the country.

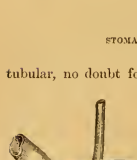
That the Desmodus is specially organised for a peculiar diet is shown by the extraordinary structure of its stomach, which, as described by Professor Huxley, whose observations are confirmed by Professor Peters, differs from that of any other Mammal. The gullet (*g* in figure) is exceedingly narrow, and opens into a transversely elongated tubular stomach, which passes directly on the right side into the intestine (*i*), the duodenum and stomach not being separated by any pyloric constriction, and

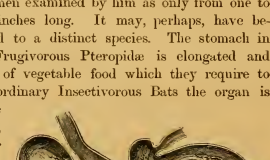
* The wound is, in fact, very much like that which many of our readers must occasionally have inflicted on themselves in shaving; and those who are experienced in such matters will know how long it takes to stop the bleeding thus produced.

the limit of the stomach in this direction being indicated solely by the insertion of the gall-ducts at a point only one-fifth of an inch from the opening of the gullet. The other, or cardiac division of the stomach, on the contrary, is enormously developed, forming an elongated and convoluted cæcum (*c*) several inches long, and becoming considerably wider than at its origin. In one specimen examined, the body of the Bat measured only three inches and one-fifth in length; the intestine, from the pylorus to its termination, was eleven inches long; while the above-mentioned cæcal portion, when straightened out, was six inches and a half in length, or twice as long as the body, and nearly two-thirds the length of the intestine. Professor Peters describes the cardiac cæcum in the specimen examined by him as only from one to two inches long. It may, perhaps, have belonged to a distinct species. The stomach in the Frugivorous Pteropidæ is elongated and tubular, no doubt for the reception of the large quantity of vegetable food which they require to support their existence. In the ordinary Insectivorous Bats the organ is small and globular, with the pyloric and cardiac orifices near each other, the nourishment afforded by their usual diet being in a tolerably concentrated form and firm condition. The extraordinary cæcum of the blood-suckers, no doubt, serves as a reservoir for their fluid nutriment, in which it may be stored for a time almost unchanged, and gradually subjected to the process of digestion.



STOMACH OF DESMODUS.


STOMACH OF LONG-EARED BAT.


STOMACH OF PTEROPUS.

The second species of blood-sucking Bat mentioned in the earlier part of this article, *Diphylla ecaudata*, agrees with the Desmodus in its dentition and general characters, but is entirely destitute of interfemoral membrane, and has the lower incisors pectinate.

The following table of the classification of Bats here adopted will assist the reader in the comprehension of the information given in the preceding pages:—

SUB-ORDER I.—MEGACHIROPTERA.

Family I.—PTEROPIDÆ.

Group 1.—*Pteropi*.—Tongue moderate; molars well developed. Genera.—Pteropus, Cynopterus, Cynonycteris, Harpyia, Epomophorus, Hypsignathus, and Cephalotes. **Group 2.**—*Macroglossi*.—Tongue very long; molars very small. Genera.—Macroglossus, Eonycteris, and Notopteris.

SUB-ORDER II.—MICROCHIROPTERA.

A.—*Vespertilionine Alliance.*

Family II.—RHINOLOPHIDÆ.

Sub-family 1.—Rhinolophinæ.—First toe with two, remainder with three phalanges. Genus.—Rhinolophus.

Sub-Family 2.—Phyllorhininæ. Toes equal, each of two phalanges. Genera.—Cœlops, Phyllorhina, Rhinonycteris, and Triænops.

Family III.—NYCTERIDÆ.

Sub-family 1.—Nycterinæ.—Nasal apparatus concealed; tail long. Genus.—Nycteris.

Sub-family 2.—Megadermatinæ.—Nose-leaf distinct; tail short. Genus.—Megaderma.

Family IV.—VESPERTILIONIDÆ.

Group 1.—*Vespertiliones*.—Crown of head flat, or nearly so; upper incisors close to canines; ears moderate, separate. Genera.—Vespertilio, Vesperugo, Chalinolobus, Scotophilus, Nycticejus, Atalapha, and Kerivoula. **Group 2.**—*Plecoti*.—Head and incisors as above; ears very large, generally united. Genera.—Plecotus, Synotus, Histiotus, Otonycteris, Corynorhinus, Nyctophilus, and Antrozous. **Group 3.**—*Miniopteri*.—Crown greatly elevated; upper incisors separated from canines. Genera.—Natalus, Miniopterus, and Thyroptera.

B.—*Emballonurine Alliance.*

Family V.—EMBALLONURIDÆ.

Sub-family 1.—Emballonurinæ.—Tail slender; upper incisors weak. **Group 1.**—*Emballonuræ*.—Frontal bones convex. Genera.—Furia, Saccopteryx, Rhynchonycteris and Emballonura. **Group 2.**—*Taphozoi*.—Frontal bones with a concavity; pre-maxillary bones separate in front. Genera.—Coleura, Taphozous, Diclidurus. **Group 3.**—*Rhinopomata*.—Frontal bones concave; pre-maxillaries united (a small nose-leaf). Genus.—Rhinopoma. **Group 4.**—*Noctilliones*.—First phalanx of middle finger extended in repose. Genus.—Noctilio.

Sub-family 2.—Molossinæ.—Tail thick; upper incisors strong. **Group 5.**—*Molossi*.—Middle finger with two phalanges. Genera.—Mormopterus, Molossus, Nyctinomus, and Chiromeles. **Group 6.**—*Mystacinæ*.—Middle finger with three phalanges. Genus.—Mystacina.

Family VI.—Phyllostomidæ.
Sub-family 1.—Lobostominæ.—Nostrils in front of muzzle; chin with erect cutaneous ridges. Genera.—Chilonycteris, Pteronotus, Mormops.
Sub-family 2.—Phyllostominæ.—Nostrils on upper surface of muzzle; chin with warts. **Group 1.**—*Vampyri.*—Molars with W-shaped cusps; four upper incisors; muzzle long; tongue moderate. Genera.—Macrotus, Lonchorhina, Macrophyllum, Vampyrus, Schizostoma, Lophostoma, Trachyops, Phyllostoma, Carollia, Rhinophylla. **Group 2.**—*Glossophagæ.*—Like the Vampyri, but tongue very long, and lower lip divided by a deep groove. Genera.—Glossophaga, Monophyllus, Ischnoglossa, Phyllonycteris, Lonchoglossa, Glossonycteris. **Group 3.**—*Stenodermata.*—Muzzle short; molars with a cutting outer edge; four upper incisors. Genera.—Steneoderma, Artibeus, Phyllops, Vampyrops, Pygoderma, Ametrida, Chiroderma, Sturnira, Brachyphylla, Centurio. **Group 4.**—*Desmodontes.*—No true molars; two upper incisors. Genera.—Desmodus, Diphylla.

We have already remarked that of these families the Vespertilionidæ may be regarded as the types of the whole order; they realise all the notions that we form in our minds when we speak of "a Bat," and this with the greatest simplicity, or with the smallest amount of complication from subordinate characters. Next to them in this respect come some of the Emballonuridæ. The other families group themselves round these, or the whole of the other Microchiroptera may be said to surround the Vespertilionidæ. Mr. Dobson, accepting the notion of the origin of organic forms by a process of evolution, assumes an unknown group of ancestral forms (*Palæochiroptera*) from which in the first place the Vespertilionidæ and Emballonuridæ diverge, forming the roots of his two "alliances." From the Emballonuridæ proceed the Phyllostomidæ, and from the Vespertilionidæ the Nycteridæ and Rhinolophidæ. From this point of view these Bats may be regarded as allied to the Insectivora through some unknown common ancestors; but what these may have been, or by what stages the Bat-type originated from the ordinary quadruped, it is very difficult to imagine. The facts of geographical distribution go for, however, to confirm the view that the Vespertilionidæ and Emballonuridæ are the central and oldest types of Bats; their distribution is world-wide, and even some nearly allied forms are found in very distant parts of the world. The other families are more restricted in their range, the Nycteridæ and Rhinolophidæ being confined to the Eastern, and the Phyllostomidæ to the Western hemisphere, and chiefly to the warmer zones, whereas the Vespertilionidæ extend much further to the north.

The Pteropidæ, or Frugivorous Bats, however, cannot well be brought into this scheme of descent. They stand completely isolated from the rest of the order, and their peculiar distribution would almost seem to indicate that their origin and relationships were distinct from those of the other Bats. Their range, which sweeps round the shores of the Indian Ocean from the Cape of Good Hope to Australia, and extends, perhaps somewhat exceptionally, into the islands of the Pacific, although it cannot be said to coincide with that of the Lemuroids, being so much wider, at least includes the whole of the localities in which the latter are met with; and if the Lemuroids are really, as seems probable, segregated descendants of a great fauna which inhabited the supposed sunken continent of "Lemuria," the same origin may fairly be ascribed to the Pteropidæ, and their wider distribution may be accounted for by their much greater power of locomotion. In connection with this it is interesting to note the strong Lemurian resemblances presented by many of the Pteropidæ; and further, the sort of common point of junction between the Lemuroids, the Pteropids, and the Insectivora, furnished by that curious animal the *Galeopithecus*, or Flying Lemur, which is also still an inhabitant of a region haunted by Lemuroids and Pteropine Bats. The Pteropidæ thus seem to stand quite apart from the other Bats. From a genealogical point of view, which indeed is that which we always take of the relationships of animals, whether we believe in the doctrine of descent or not, we may ask whether the two sub-orders of Bats have not been realised in their present form through two quite different series of modifications.

The appeal to fossil evidence, which in some cases leads to satisfactory results, gives us no clue to the origin of the different groups of Bats. Of the Pteropidæ no fossil remains are known. Of the other families the most ancient remains are, as might be expected, those of the Vespertilionidæ, several species of which have been found in Miocene beds at Mayence and in the south of France, and even in the Eocene gypsum deposits of the Paris basin. Other bones identical with those of species now living in the same localities have been detected in bone-caves in various parts of Europe. Bones of a *Rhinolophus* have occurred in the cavern of "Kent's Hole," near Torquay; and the celebrated bone-caves of Brazil have furnished numerous remains of Bats, all of which, however, are referable to the peculiarly South American family Phyllostomidæ. Thus, so far as we are acquainted with them, the fossil remains of Bats, even the most ancient, indicate only forms more or less nearly related to those still existing in the same localities, and furnish us with no means even of speculating upon the course of events by which, so to speak, the type of the Chiroptera was evolved.

W. S. Dallas.

LOW'S PTILOCERQUE.

ORDER INSECTIVORA.

CHAPTER I.

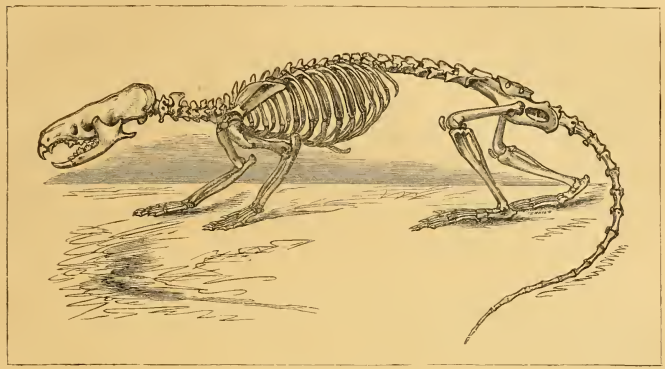
COLUGOS—RANGSRINGS—JUMPING SHREWS—HEDGEHOGS—TANRECS—RIVER SHREWS.

Functions of the Insect-eaters in the Order of Nature—Their leading Peculiarities—Classification—COLUGOS—Various Opinions regarding their Place—COLUGO, OR FLYING LEMUR—The *Patagium*—Parachute-like Membrane—Dentition—Offspring—Diet—BANGSRINGS—TANA—FERRUGINOUS BANGSRING—HORSFIELD'S BANGSRING—LOW'S PTILOCERQUE—SHORT-TAILED BANGSRING—JUMPING SHREWS—ELEPHANT SHREW—ALGERIAN JUMPING SHREW—PETRODROME—RHYNCHOCYON—HEDGEHOG—Characteristics—Distribution—Diet—Attacks Snakes and Vipers—Taste for Eggs and Game—Its "Spiny Skin"—"Rolled up"—Enemies—Female and Young—LONG-EARED HEDGEHOG—COLLARED HEDGEHOG—BULAU—TANRECS TANREC—TENDRAC—TELFAIR'S TENDRAC—RICE TENDRAC—EARED EARTH SHREW—AGOUTA—ALMIQUI—WEST AFRICAN RIVER SHREW.

IN the grand economy of nature small things play sometimes very considerable parts; and the innumerable hosts of insects, making up by their numbers for their individual insignificance, are of very great importance in a great variety of fashions. One of their most striking functions is undoubtedly the checking of vegetable growth. They attack plants in all parts—in the roots, the stem, the branches, the leaves, and the flowers and fruit—in this way, while merely obeying their own appetites, imposing a constant check upon the increase of vegetation; and being for the most part specially confined to particular plants or groups of plants, they assist materially in preserving the balance of power in the vegetable world. At the same time, it must be borne in mind that there is the same tendency in insects, as in any other group of organisms, to inordinate increase. The checkers thus need a check in their turn, and the number of other creatures whose business it seems to be to keep down the undue multiplication of insects is exceedingly great.

We have seen that among the Mammalia the Bats for the most part have this duty imposed upon them. They attack the winged armies of perfect insects in the air, and must cut off an enormous number of potential parents of plant-eating larvæ. But there are a great many insects which

seldom or never rise into the air, and the larvæ of those which are aerial in their perfect state are of necessity confined to the ground or the vegetation growing on it; these are not without their



SKELETON OF SHREW.

Mammalian enemies. Many Mammals of the Carnivorous and Marsupial orders feed wholly or partially upon insects; but there is one order most of the species of which are exclusively, or almost exclusively, confined to a diet of terrestrial insects, worms and "such small deer," and which has consequently received the name of Insectivora, or "the insect-eaters." On trees, on the ground, and even beneath its surface, and in the water, these animals chase insects and their larvæ; and if they diversify their diet with worms and other invertebrates, or by attacking and devouring frogs, fishes, and small birds and Mammalia, or even in some cases feed chiefly upon such articles, or on fruit, the predominating taste for insects among the members of the order may justify the name.

DENTITION OF HEDGEHOG.

The Insectivora are in many respects related to the Bats, and in some cases show a sort of affinity to the lower Quadrumana. In appearance many of them show analogy to different families of Rodents, or gnawing Mammals, the Shrews especially being exceedingly mouse-like in their aspect; but, as might be expected from the difference in the habits, and especially in the diet of the animals, the simple inspection of the teeth is always sufficient to distinguish the members of these two orders.

The leading peculiarities of the Insectivora may be briefly indicated, with reference to the groups which approach them most closely in certain points of structure. The limbs are all organised for walking or digging, the fore limbs never being modified, as in the Bats, into organs of flight, and the two bones of the fore-arm (*radius* and *ulna*) are always more or less distinct. There is no opposable thumb, either on the fore or the hind feet. The teeth, which are always encased in enamel, are of the usual three kinds—incisors, canines, and molars *—and the dentition generally resembles that of the strictly Insectivorous Bats, the molars

* There is sometimes a difficulty in distinguishing between canines and premolars, and it will be seen, hereafter, that in some cases the canines are supposed to be wanting; but no Insectivore possesses two chisel-like, constantly-growing incisors in each jaw, separated by a long interval from the molars, as in the Rodents, or Gnawing Mammals.

especially being similarly furnished with several sharp cusps or points, which are regarded as characteristic of Insect-eating Mammals. All the teeth are implanted in the jaws by roots.

In the development of the tail, and the nature of the covering of the skin, the Insectivora present considerable diversities, which will be referred to hereafter. Their feet generally consist of five toes, all armed with claws, and nearly all are plantigrade—that is to say, they apply the whole, or nearly the whole, of the sole of the foot to the ground in walking. With a single exception (*Potamogale*, which is rather anomalous in some other respects), all the Insectivora are provided with complete clavicles, or collar-bones—a character which serves to distinguish them from the Carnivora, in which the collar-bones are either deficient or imperfectly developed. The teats are generally numerous, and situated on the abdomen, the only exceptions being the anomalous Colugo, or so-called Flying Lemur, and the Golden Moles, in which the teats are situated on the breast.

Zoologists are now pretty well agreed as to the classification of these animals, although there are still differences of opinion as to the best arrangement of the families, and some minor points. The classification here adopted is founded upon that proposed by Professor Mivart in 1871, and afterwards modified by Professor Theodore Gill. In this the whole order is divided into nine families, the first of which is so anomalous, and so divergent from all the rest in its characters, as to have led to its being treated as constituting a distinct sub-order (Dermoptera).

FAMILY I.—GALEOPITHECIDÆ, OR COLUGOS.

The animals which constitute this family, now regarded as constituting only two species (although the right even of one of these to specific rank is somewhat doubtful), are in truth amongst the most anomalous of Mammals. In their characters they present the most singular resemblances to at least three orders of Mammalia, in which they have been successively placed by various zoologists. Discovered by the Dutch voyagers of the seventeenth century in the luxuriant forests of the Eastern islands, their general Lemur-like aspect led the naturalists of those days to class them with those creatures, and Camelli, the distinguished botanist, gave them the name of *Galeopithecus*, which became in Petiver's hands, "*Cato-simius volans*," or the Flying Cat-Monkey. Seba left out the Monkey, and called the animal simply the Flying Cat of Ternate (*Felis volans ternatea*); whilst Bontius, laying undue weight on its so-called flying powers, regarded it as a Bat, and gave it the name of *Vespertilio admirabilis*. Linnæus accepted the Lemur hypothesis, and placed the animal in his genus *Lemur*, under the name of *Lemur volans*, or the Flying Lemur, and this position it continued to hold for a very long time, although Pallas separated it from the true Lemurs under Camelli's name of *Galeopithecus*. No one ever reverted to the notion that the Colugo was a Bat, but from time to time various naturalists have pointed out that in many of its characters it approached the Insectivora; and of late years the evidence in favour of its belonging to that order has been put forward so strongly, that nowadays nearly all zoologists regard it as an exceedingly aberrant member of the group, with more or less distinct tendencies towards the Bats and the Lemurs, and perhaps with some faint trace of the Marsupial about it. Mr. Wallace, speaking, of course, from the standpoint of the theory of evolution, says that "this animal seems, in fact, to be a lateral offshoot of some low form, which has survived during the process of development of the Insectivora, the Lemuroidea, and the Marsupials, from an ancestral type." There is no doubt that the beast is sufficiently dissimilar from all other known Mammals to give a considerable air of probability to the assumption of its being a survivor from some earlier period of the earth's history; but as it is here we must do the best we can with it, and its natural position is certainly between the true Insectivora and the Lemurs. As the characters of the family are founded virtually upon a single species, one description will serve.

THE COLUGO, OR FLYING LEMUR.*

The species known to the older naturalists is found in Malacca, Sumatra, and Borneo, where it inhabits the forests, climbing the trees like a Squirrel by the aid of its claws, and passing through the air from one tree to another by means of a membrane (*patagium*), which extends along the sides of the

* *Galeopithecus volans.*

body, and can be stretched by the extension of the limbs to which it is attached so as to act as a sort of parachute, which supports its owner after the same fashion as the very similar fold of skin that exists in the same position in the so-called Flying Squirrels and Flying Opossums. In the Colugo, however, this curious arrangement is carried further than in the other groups of Mammals just mentioned; for, as in the Bats, there is a distinct antebrachial membrane, stretching along the front of the arms from the wrists to the sides of the neck; and the space between the hind limbs is occupied by an ample triangular membrane, down the middle of which the long tail passes, and which is also stretched by the extension of the limbs. Even the toes are joined by membranes as far as the base of the claws, and this great development of the skin must be regarded as to a certain extent approximating the creature to the Bats. The whole of this fold of skin is clothed both above and beneath with hair; and although some observers have described the animal as moving its expanded membranes during flight, no approach to the peculiar action of the Bat's wing can ever be made by it. The most striking point in which it exceeds the other parachute-bearing Mammals is the development of the membrane between the hind limbs, and this, by the action of the tail, may be made to exert a powerful influence upon the course of the animal during its so-called flights. Mr. Wallace, who had the opportunity of observing the Colugo in its native haunts, describes its flight as follows:—"Once, in a bright twilight," he says, "I saw one of these animals run up a trunk in a rather open place, and then glide obliquely through the air to another tree, on which it alighted near its base, and immediately began to ascend. I paced the distance from the one tree to the other, and found it to be seventy yards, and the amount of descent I estimated at not more than thirty-five or forty feet, or less than one in five. This, I think, proves that the animal must have some power of guiding itself through the air, otherwise in so long a distance it would have little chance of alighting exactly upon the trunk." In a subsequent work, following other writers, he refers this power to the agency of the tail, and even thinks that the animal may rise over obstacles in its course by the elevatory action of that organ. The tail is of considerable length, and according to some writers its extremity has a slight prehensile action which is of assistance to the animal in climbing. The membranes, when not in use, as when the Colugo is walking or climbing, fall in great folds at the sides of the body.

HIND FOOT OF COLUGO.

BONES OF HIND FOOT OF COLUGO.

Passing now, by a natural transition, from the parachute-like membranes to the limbs which traverse and serve to extend them, we find that these exhibit certain peculiarities of structure which are amongst the anomalies of this singular creature. The bones of both fore and hind limbs are elongated and slender—a character which contrasts strongly with the general state of things in the Insectivora—and the ulna, which is particularly slender, is united to the radius towards the extremity. The feet consist of five digits, and they are specially adapted to enable the animal to climb readily upon the bark of the trunks and branches of trees. In the hind feet especially part of the tarsal bones (the navicular and cuboides) are constructed so that they can easily turn upon the astragalus and calcaneum, and thus the sole is turned inwards, an arrangement which facilitates the clasping action of the feet. The inner digits in all the feet possess considerable power of independent motion, although they are never converted into opposable thumbs; and this arrangement, combined with the presence of sharp strong claws upon all the toes, must greatly favour the peculiar mode of life of the animal. It is to be remarked that the structure of the hind feet presents some analogy to that prevailing in Bats, and that in repose the Colugo suspends itself from a branch by

the fore and hind feet, with the body and head hanging downwards, which is also a habit somewhat reminding us of the Chiroptera.

The head in the *Galeopithecus* is tolerably broad and a little flattened; the eyes are placed more laterally than in the Lemurs, and the orbits containing them form a bony ring which is interrupted behind.

LOWER INCISORS OF COLUGO.

The teeth are very peculiar. In the upper jaw there are on each side two incisors, those of one side separated from those of the other by a very wide space. The foremost of these incisors on each side has a single root and a notched crown; the hinder one is pointed and implanted by two roots. The canine which follows also possesses two roots; and this is followed by a molar series of five teeth, each inserted into the maxillary bone by three roots, and having a crown with three, four, or five cusps. In the lower jaw, which has the condyle curiously produced outwards, we find again on each side a series of five molar teeth, and in front of these a long canine with two roots; but the whole fore part of the jaw is occupied by six single-fanged incisors; the crowns of these are nearly horizontal, broad, flat, and notched, the notching of the two middle pairs being so deep as to form a regular comb. This structure is exceedingly remarkable, and occurs in no other animals, the nearest approach to it being the slightly pectinated teeth in the Desmodont Bats.

The teats in the *Galeopithecus* are situated on the sides of the breast, in the neighbourhood of the armpits. There is a pair on each side, placed close together, and on the same level. The female produces only a single young one at a birth, and the little creature, described by Mr. Wallace as at first very small, blind, and naked, clings closely to the breast of the mother, which is quite bare and very much wrinkled. Mr. Wallace sees in this adaptation of the region of the teats to the wants of an exceedingly incomplete offspring, some trace of a remote relation to the peculiarities of the Marsupials. The stomach in this curious animal is of considerable size; and the intestine is furnished with a sacculated cæcum as long as the stomach.

COLUGO.

The Colugo varies considerably in colour, but is usually of an olive, brown, or blackish colour, mottled with whitish spots and blotches, which are said by Mr. Wallace to give it a resemblance to the colour of mottled bark, sufficient to render it difficult of observation. The lower surface of the body and membrane is of a tawny grey colour, and the whole of the fur which clothes the body and membranes is, although short, most exquisitely soft in texture. The length of the animal is about eighteen or twenty inches.

The brain in the *Galeopithecus* is very small, and Mr. Wallace found it to possess such a remarkable tenacity of life that it was killed with difficulty by any ordinary means. He describes it

as sluggish in its habits, at least during the day, when it generally rests clinging to the trunks of trees, and at this time, if it has occasion to move, it goes up the tree by short runs of a few feet, and then stops a moment as if it found the action difficult and fatiguing. We have already quoted Mr. Wallace's description of the flight of the animal as witnessed by him early in the evening, and no doubt it is active enough during the dark hours.

The regular food of the Colugo appears to consist of vegetable substances, but authors differ somewhat in their statements upon this subject. By most zoologists it is said to feed on fruits; but Mr. Wallace says that "like the cuscus of the Moluccas, the *Galeopithecus* feeds chiefly on leaves." From the statements of some naturalists it would seem that it occasionally or habitually adds insects to its diet, and also that it frequently captures and devours small birds. In all probability the truth is that it eats almost anything that comes in its way.

SKULL OF COLUGO.

Some five or six supposed species of *Galeopithecus* have been described by various authors, but most of these are now admitted to be founded upon young animals, or upon mere varieties. The Colugo of the Philippine Islands is, however, generally regarded as a distinct species, although even as to this there is some doubt. It was described by Mr. Waterhouse as *Galeopithecus philippinensis*, and presents a close general resemblance to the species above described, but is smaller, has a shorter head, and shows certain slight differences in the teeth.

FAMILY II.—TUPAIIDÆ, OR BANGSRINGS.

The preceding family, as already stated, is regarded by Mr. Gill as constituting an actual sub-order of Insectivora, and we have seen that its characters are really of a very singular kind. The remainder of the order is treated by him as forming a single great group, characterised by the absence of parachute membranes, the shortness and robustness of the limbs, and by the want of that peculiar comb-like structure of the incisor teeth which distinguishes the *Galeopitheci* from all other Mammals. Moreover the condylar process of the lower jaw is never extended outwards. This group Mr. Gill proposes to name *Bestiæ* or *Insectivora vera*.

The Bangsrings, or Sinsrings, form the first family, called Tupaiidæ, from the name of the most characteristic and best known genus *Tupaia*, which again was derived by its discoverer and first describer, Sir Stamford Raffles, from the native name for a Squirrel, with which these animals are confounded by the Malays of Sumatra. The Bangsrings have either four or six incisors in the upper, and always six in the lower jaw; and three or four premolars, and four true molars on each side in both jaws. The canines are situated far back, and have a single root. In the skull the orbit is usually complete, or nearly so, and there is a complete zygomatic arch, with a small slit or aperture beneath the orbit. The bones of the shank are separate; the intestine has a large cæcum; and the feet are furnished with five toes, armed with strongly curved claws. The upper molar teeth are formed of two nearly equal parts, anterior and posterior, each of which represents a triangular prism narrowed inwards.

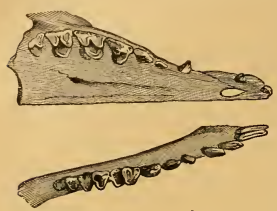
The Bangsrings live in and about trees, where their activity and general appearance give them a considerable resemblance to small Squirrels or Lemurs. They also remind one considerably of some of the smaller Marsupials. Their fur is exceedingly fine and soft; their tail generally long and well-clothed with hair (except in *Hylomys*); and their food consists partly of fruits and partly of insects. The species inhabit South-eastern Asia and the islands of the Eastern Archipelago.

THE TANA.*

In the genus *Tupaia* (or *Cladobates*) from which the present family takes its name, there are four small incisor teeth separated from each other in the upper jaw; and six incisors, the middle four of which are close together, long, and much inclined forwards in the lower jaw. The upper canines are at

* *Tupaia tana*.

some distance from the hindmost incisors, the lower ones close to them (see figure). Behind the canines there are on each side in both jaws three premolars, which increase in size backwards. These are followed by three true molars.



DENTITION OF FERRUGINOUS BANGSRING.

The bony orbit is a complete ring, and the zygomatic arch is also complete, but perforated by an elongated aperture. The ears are of moderate size, and rounded; the eyes large and prominent; and the tail long, and well clothed with hair throughout its whole length; in fact in most species it is a bushy organ like that of many Squirrels.

In the Tana (*Tupaia tana*) the arrangement of the hair on the tail in two rows, something after the fashion of the barbs of a feather on the shaft, which is more or less recognisable throughout this genus, is especially remarkable; and as the hair is very long, the tail is rendered particularly bushy. This animal is one of the larger species, the body measuring from eight to nine inches in length, and its colour is rather variable, although usually exhibiting various shades of reddish-brown, becoming darker or blackish on the hinder part of the back, where, moreover, the greater part of the hairs are of uniform tint and not grizzled. The colour of the tail appears to be especially liable to vary—thus, according to Dr. Günther, in the ordinary form of the species the tail is black above, with the basal half of each hair rusty brown, and dark brown below; in another variety, described by Wagner as a distinct species under the name of *T. speciosa*, the tail is brownish-red above, and bright rusty-red below; whilst in the beautiful form from which our

TANA—GOLDEN-TAILED VARIETY. (From the *Proceedings of the Zoological Society.*)

illustration is taken the whole organ is of a reddish golden-yellow colour. This is Dr. Günther's variety, *chrysura* (golden tail).

The Tana is an inhabitant of the forests of Sumatra and Borneo. According to Sir Stamford Raffles, the animal is known to the country people of Sumatra under the name of *Tupai tana*, and he was informed that it was always found on or near the ground. A nearly allied but much smaller species (*T. splendidula* of Dr. Gray) occurs with it in the last-named island; and another larger one (*T. nicobarica*) is found in the Nicobar Islands.

THE FERRUGINOUS BANGSRING.*

This species, the *Tupai Press* of the Malays of Sumatra, and the *Kekkes* of the Sundanese in Java, is more widely distributed than the preceding, being found not only in the two islands above mentioned, but also in Borneo, Penang, and Singapore. It was first described by Sir Stamford Raffles. It is one of the larger species, the head and body measuring about eight inches, and the tail being fully of equal length. The colour of its fur is almost entirely a rusty red, becoming darker, however, on the tail and the hinder part of the back, where the hairs are more or less grizzled with white. The tail is not so bushy as that of the Tana. The aperture under the orbits is of an elongated oval form.

Sir Stamford Raffles, in his original account of this animal, describes it as being very lively and playful in its habits, and as feeding on fruits. He first saw it tame in the house of a gentleman in Penang, and states that this individual "was suffered to go about in perfect liberty, ranged in freedom over the whole house, and never failed to present himself on the breakfast and dinner table, where he partook of fruit and milk." Dr. Cantor, in his "Catalogue of the Mammalia inhabiting the Malayan Peninsula and Islands," gives the following interesting account of this Bangsring:—"The young of this very numerous species in hilly jungle," he says, "is easily found, and becomes familiar with its feeder, though towards strangers it retains its original mistrust, which, in mature age, is scarcely reclaimable. In a state of nature it lives singly or in pairs, fiercely attacking intruders of its own species. When several are confined together, they fight each other, or jointly attack and destroy the weakest. The natural food is mixed insectivorous and frugivorous. In confinement individuals may be fed exclusively on either, though preference is evinced for insects; and eggs, fish, and earth-worms are equally relished. A short, peculiar, tremulous whistling sound, often heard by calls and answers in the Malayan jungle, marks their pleasurable emotions; as, for instance, on the appearance of food; while the contrary is expressed by shrill protracted cries. Their disposition is very restless, and their great agility enables them to perform the most extraordinary bounds in all directions, in which exercise they spend the day, till night sends them to sleep in their rudely-constructed lairs in the highest branches of trees. At times they will sit on their haunches, holding their food between the fore-legs; and after feeding they smooth the head and face with both fore-paws, and lick the lips and palms. They are also fond of water, both to drink and to bathe in. The female usually produces one young." Dr. Cantor also states that "the lateral raised lines of the palms and soles, the posterior part of the first phalanges and the third phalanx, which is widened into a small soft disc, in fact, all the points which rest on the ground, are studded with little transversely-curved ridges, or duplications, similar to those observed under the toes of some Geckotidæ [Wall-Lizards], which fully accounts for the precision with which these animals perform the most astounding leaps from below, barely touching with their soles the *point d'appui* above. In a cage," he adds, "the *Tupaia* will continue for hours vaulting from below, back downwards, poise itself for an instant, continuing back downwards under the horizontal roof, and regain the point of starting, and thus describe a circle, the diameter of which may be three or four times the length of the animal, in far shorter time than is required for the description."

Allied to the Ferruginous Bangsring, and of nearly the same size, are two species which must be referred to on account of their geographical distribution, which carries this type of animals much farther to the west than we should expect. These are Elliot's Bangsring (*T. Ellioti*), a species with unusually short and harsh fur, specimens of which have been obtained from Madras, Bengal, and Bombay; and Belanger's Bangsring (*T. Belangeri*), originally procured in Pegu, but which also occurs in Burmah and Sikkim.

Horsfield's Bangsring (*Tupaia javanica*) is a smaller animal than the preceding, an adult specimen measuring only about thirteen inches long, of which about one-half goes to the tail. The colour of its fur is greyish-brown, grizzled on the back, and with a whitish line on each shoulder. It inhabits Borneo, Sumatra, Java, and Arracan. The Little Bangsring (*T. minor*) is a still smaller species, measuring only five inches and one-third in length of body, but closely resembling the preceding in its characters. It is described by Dr. Günther from Bornean specimens. The Murine Bangsring (*T. murina*), which forms the genus *Dendrogale* of the late Dr. Gray, has also only been

* *Tupaia ferruginea.*

found in Borneo. It is a small species allied to the preceding, but has the tail more rat-like, and clothed only with comparatively short hairs, those of the lower surface especially being very short.

LOW'S PTILOCERQUE.*

Besides the true Bangsrings forming the genus *Tupaia*, this family includes two other small animals, one of which, Low's Ptilocerque, is a very elegant little creature. The specimen originally described by Dr. Gray in 1848 was captured by Mr. Low in Rajah Brooke's house in Borneo. It has a rather shorter head than the true Bangsrings, but its dentition is nearly the same; the aperture under the orbit is round, and the circle of the bony orbit is not quite complete behind. The most distinctive character of the animal is, however, to be found in its tail, which is an exceedingly peculiar organ. The tail itself is long and slender, and instead of being thickly clothed with bushy hairs, as in the Bangsrings, it has the basal portion hairy; then a long piece naked, covered with rings of broad, square scales, among which there are only a few short, scattered hairs; and, finally, about a third of its length is furnished with long hairs arranged on the two sides of the tail, so as to produce the appearance of the two wings of a dart or arrow (see figure, p. 342).

The Ptilocerque, which is an inhabitant of Borneo and Sarawak, is between five and six inches long, with a tail rather longer than the body. Its general colour is blackish-brown above, minutely grizzled by the yellowish tips of the hairs; the lower parts and the cheeks are yellowish, and there is a black streak on each side of the face, enclosing the eyes. The tail is black, with the long hairs of the tip white, except a few towards the base. The habits of the animal are probably the same as those of the Tupaias.

THE SHORT-TAILED BANGSRING.†

A curious little animal belonging to this family was discovered in Sumatra by Dr. S. Müller. It has its muzzle produced into a long, movable snout, and the tail very short and naked. The skull is flatter than in the true Bangsrings; the orbit is incomplete; the sub-orbital aperture is in the form of a little fissure; and the dentition is different, there being six incisors in the upper as well as in the lower jaw, and four premolars on each side in both jaws. The total number of teeth is thus forty-four instead of thirty-eight. This animal has been found in Java and Sumatra.

The same, or a very nearly allied species, has been obtained in Pegu, and described by Mr. Blyth under the name of *Hylomys peguensis*. Professor Gill regards these animals as most nearly related to *Gymnura* in the family Erinaceidæ.

FAMILY III.—MACROSCELIDIDÆ, OR JUMPING SHREWS.

Some curious little creatures, peculiar to Africa and its islands, in which, as in the Jerboas and Kangaroos, the hind legs are more developed than the fore limbs, enabling the animals to advance in a biped fashion by a succession of leaps, are regarded by most zoologists as nearly related to the Bangsrings; in fact, both Professor Mivart and Mr. Gill make these two families form a distinct tribe of Insectivora. They both have the same kind of molar teeth, and the intestine furnished with a large cæcum. But whilst the Bangsrings are squirrel-like animals, with feet adapted for a life in trees, the Jumping Shrews are mouse-like creatures, of terrestrial jumping habits, and furnished with a long, thin, proboscis-like muzzle, which has procured for them the name of Elephant Shrews. They have large eyes, and ears of a moderate size and rather widely separated; their hind limbs are considerably elongated, especially the shank and the metatarsus, or portion forming the foot, which has a naked sole that is applied to the ground; the two bones of the shank (tibia and fibula), and in general those of the forearm (radius and ulna), are attached to each other at the lower end; and the first or inner toe is either placed further back than the others, or altogether deficient. The sides of the muzzle are usually furnished with very long whiskers. The tail is long, and more or less rat-like, but covered with short hairs.

In two of the three genera into which the family is divided the number of teeth is forty, namely,

* *Ptilocercus Lowii.* † *Hylomys suillus.*

on each side, incisors, $\frac{3}{3}$, canines, $\frac{1}{1}$, premolars, $\frac{3}{3}$, and molars, $\frac{3}{3}$, the incisors being small, and the upper canines furnished with two roots. In the exceptional genus *Rhynchocyon*, which includes only a single species, there is only one incisor in the upper jaw, and even this falls out as the animal grows old.

The species of this family are peculiar to Africa, where they are found in Algeria and Barbary, along the east coast, and at the Cape of Good Hope.

SOLE OF RIGHT HIND FOOT OF ELEPHANT SHREW.

THE ELEPHANT SHREW.*

This appears to be the commonest species in Southern Africa, where its habits were observed by the late Sir Andrew Smith, who founded for it the genus *Macroscelides*. It is about five inches long, with a tail of about three inches, and its colour is a tawny brown, becoming whitish on the limbs. It is diurnal in its habits, and very active, hunting for its insect prey among the scanty herbage and stunted shrubs, which alone flourish in the dry rocky spots which it chooses for its place of habitation. It resides in burrows in

ELEPHANT SHREW.

the ground, and when disturbed immediately rushes to take shelter in its home, or under some neighbouring rock or stone.

Sir Andrew Smith described several other South African species, and at least one has been obtained on the Mozambique coast. In their structure and general habits they agree with the above-mentioned animal.

THE ALGERIAN JUMPING SHREW.†

Besides these southern species, however, the French naturalists have discovered a species of this genus in Algeria, and it is also found to inhabit Barbary. It is known to the French colonists in Algeria by the name of the "*Rat à trompe.*" This animal is of the same size as the preceding—that is to say, about five inches long; its tail measures four inches, and its long slender snout about half an inch. It has a soft tawny fur on the back and sides, and the lower surface is whitish. The Algerian Jumping Shrew is said to feed not only upon insects, but also upon vegetable matters. It is gentle and inoffensive, and may be easily tamed, when its gambols are said to be very sprightly and amusing.

* *Macroscelides typicus.* † *Macroscelides Rozeti.*

THE PETRODROME.*

The Mozambique coast produces another species of this family, agreeing with those just noticed in nearly all its characters, but of much larger size, and further distinguished from them by having only four toes on each hind foot. The first toe, which is pushed far back, and considerably reduced in size in the Elephant Shrews, is entirely deficient in the Petrodrome.

SOLE OF RIGHT HIND FOOT OF PETRODROME.

While the *Macroscelides* generally live in the plains, among grass and under bushes, the Petrodrome, as its name implies, prefers localities among the hills, where cavities and fissures in the rocks furnish it with a secure refuge. In three places where Professor Peters found it, this was the case. It lives on insects. In captivity it soon becomes familiar, although at first shy, but never inclined to bite. The natives at Tette call it *Sáro*.

THE RHYNCHOCYON.†

Besides the species of *Macroscelides* already mentioned, and the Petrodrome, the coast of Mozambique has another animal which is referred to this family, although it presents several characters which separate it very decidedly from all the rest. It was first described by Professor Peters under the name of *Rhynchocyon*, which means "beaked dog," although it must be confessed that there is nothing very dog-like about it. The name is in allusion to the large size of the canine teeth.

The Rhynchocyon, which is a very rare animal in collections, appears from the description and figure of Professor Peters to be a queer-looking beast. It measures about eight inches in length, exclusive of the tail, which is rather long, tapering, and rat-like, being covered with a ringed skin, and furnished with only a few scattered hairs. The muzzle is produced

RHYNCHOCYON.

into a very long movable snout. The fur is of a rusty-brown colour, with a blackish tinge about the ears and the back of the head, and some light reddish spots on the hinder part of the back.

This animal, which is called *Mutáu* by the natives, lives in holes in the ground, from which it

* *Petrodromus tetradactylus.* † *Rhynchocyon Cernei.*

issues at night in search of the insects on which it feeds, and is chiefly interesting to the zoologist for the structural characters which it presents. Thus, whilst agreeing with the ordinary members of the present family sufficiently to warrant its being classified with them, and to prevent its going anywhere else, it differs from them in some exceedingly important particulars, which might almost justify its being placed in a family by itself. Although the hind legs are more developed than the fore limbs, the disproportion between them is hardly so great as in the true Jumping Shrews; and further, all the feet are reduced to the same four-toed condition as the hind feet in the Petrodrome, and the outer toe is shorter than the rest. But it is in the dentition that the anomaly is the greatest. The Rhynchocyon never has more than one small incisor tooth on each side in the upper jaw, and even this drops out as the creature advances in age; and the upper canine is a simple tooth with a single root. In the lower jaw there are three incisors on each side, and in both jaws the canines are followed by three premolars and three molars. In the hind legs the two shank-bones are united near the extremity as in the preceding species, but the two bones of the fore-arm (radius and ulna) are separate.

FAMILY IV.—ERINACEIDÆ, OR HEDGEHOGS.

We pass now from groups of insect-eating animals the members of which must be sought in far distant countries, to a family represented in England by a very well-known species. Our Common Hedgehog, in fact, may serve as an excellent example of the family to which it belongs, although this certainly includes one species which presents rather anomalous characters.

All the Erinaceidæ have the two molar teeth broad, as in the preceding families; in fact, here the hinder ones are nearly square, and the tubercles forming their upper surface are rounded in form. The skull has a complete zygomatic arch, and the tympanic bone forms a bubble-like swelling on each side of the back of the skull. The back is clothed with hairs, among which there are a number of strong spines or bristles. The legs are short, and formed exclusively for walking, and the hind legs have the two bones of the shank (tibia and fibula) united. The intestine has no cæcum.

These animals are confined to the Old World, in nearly all parts of which some of the species are to be found. They feed chiefly upon insects and other small animals; most of them have the power of rolling themselves up into a ball, when the prickles with which the back is armed constitute a most formidable defensive armour; and in cold countries they pass the winter in a state of torpidity. Several fossil species have been found in Tertiary deposits in Europe.

THE HEDGEHOG.*

Our Common English Hedgehog may serve as the type of this family; all the species of which, with only a single exception, belong to the same genus, and present a very close resemblance to each other, both in appearance and habits. All the Hedgehogs, in fact, are small animals of robust form, with very short tails, and the greater part of the hairs of the upper surface converted into sharp spines. The muzzle is conical, and the jaws contain thirty-six teeth, twenty of which are in the upper and sixteen in the lower jaw (see figure, p. 343). The arrangement of these teeth is peculiar. There are three incisors on each side, of which the inner one is considerably larger than the rest, and in the upper jaw these are separated by a small space from the next tooth, which is generally regarded as a premolar, in which case the animals have no canines. Behind this, in the upper jaw, are three premolars, gradually increasing in size until the third has very much the appearance of a true molar, but furnished with a cutting edge; and then three molar teeth, two of which are large and broad, nearly square, and crowned with very strong tubercles, admirably adapted for crushing the hard skins of the insects on which the Hedgehogs principally feed. The hindmost molar is a small tooth. In the lower jaw the innermost incisor is very large, and projects almost horizontally forward, and it is followed by three small teeth, the nature of which has been a matter of dispute. Two of them, however, are generally considered to be incisors, and the third a premolar, but by M. F. Cuvier they were all described as premolars, making, with another and larger tooth which follows them, four premolars in the lower as in the upper jaw. This last premolar is a carnassial or cutting tooth, corresponding to that in the upper

* *Erinaceus europæus.*

jaw. It is separated by a small space from the last of the smaller anterior teeth, and is followed by three true molars, two of which are large, and furnished with four or five sharp tubercles, while the third is small, and shows only one strong point.

In the Common Hedgehog, as in most species of the genus *Erinaceus*, the feet are all composed of five toes; the legs are short, so that the animal runs along with its belly nearly touching the ground; the spines, with which the whole upper surface is covered, are hard, sharp, round, about an inch in length, of a dirty-white colour, with a dark-brown or nearly black ring a little above the middle; the nose is black, and the unspined parts of the body are clothed with coarse yellowish-white hair. The ears are small and rounded. The total length of the adult Hedgehog is usually about ten inches.

The Hedgehog inhabits the whole of Europe except Scandinavia and the north of Russia. It is found in the Caucasus, but does not appear to extend further into Asia. It lives both in the low country and in the mountains, ascending, in the Alps and Carpathians, to an elevation of above 6,000 feet. It may be met with in almost all situations, in forests, woods, fields, gardens, and orchards,

HEDGEHOG.

where it takes up its abode in thickets, in hedge-bottoms, and even in holes in walls. In such situations it passes its days in sleep, for it is, strictly speaking, a nocturnal animal, although on rare occasions it may be seen abroad in the day-time. In similar situations it passes the whole winter in a profound slumber, forming a nest for itself of moss or leaves, sometimes under the smaller growth of woods and gardens, sometimes in a hedge-bank, in the hollows and among the bare roots of trees, and in holes among rocks or in walls. The nest most commonly consists in whole or in part of withered leaves, which appear to be useful in keeping out the wet, and as the innermost leaves are impaled upon the animal's spines, it retains a thin coat of leaves when turned out of its winter-nest.

As the spring advances, the Hedgehog rouses itself from its long sleep, and proceeds to make up for the enforced abstinence from food which it has undergone for so many weeks. It comes forth in the evening, and runs about pretty quickly, but with a curious shuffling gait, in search of the insects and other small animals which constitute its usual prey. Insects, and particularly Beetles, appear to form the greater part of its diet, and its teeth are admirably adapted for pounding up the hard skins of these creatures. In consequence of their predilection for insect food, great numbers of Hedgehogs are brought to London and other great towns, to be kept in houses for the purpose of destroying the Cockroaches (Blackbeetles, as they are commonly called) which are such disagreeable inmates of most kitchens. In the pursuit of these insects the Hedgehog shows much activity, and Mr. Bell says that he has "seen a Hedgehog, in a London kitchen, push its way beneath a piece of carpet in all directions, and heard it at intervals crushing up the Cockroaches which it met with. In a short time it freed the place of these pests." Sometimes, however, this consummation is not quite so easily attained, and we

have heard of more than one instance in which the first Hedgehog brought into the house as a Beetle-killer actually died of overfeeding, and at least one other had to be procured before the plague of Cockroaches was got rid of.

Besides insects, the Hedgehog feeds on earthworms, slugs, and snails, and in destroying the latter it may certainly be regarded as a friend to the gardener. The consumption of earthworms is performed in a rather curious manner. These animals are seized when they are enjoying the damp freshness of the air out of their holes in summer evenings, and slowly passed into the mouth of their enemy from one end to the other apparently by the simple process of mastication with the molar teeth, the unconsumed portion of the worm being constantly transferred from one side of the mouth to the other, so that both sides of the jaw may come into play. This must be an unpleasant operation for the worm, much as its captor may enjoy it. It is uncertain whether the larger snails are eaten by the Hedgehog, no fragments of their shells having been found in the stomachs of specimens examined, but the smaller species, belonging to the genera *Vitrina* and *Zonitis*, certainly form a portion of its diet. Mr. Bell says that "the small Slug, *Limax agrestis*, is a favourite morsel with the Hedgehog, and is often scratched out and eaten in the summer months when concealed in the day in crevices, or amongst the roots of grass or other close herbage."

The Hedgehog does not, however, confine itself exclusively to the consumption of invertebrate prey; Frogs and Toads, Mice, and even Snakes, are not exempt from its attacks. Mr. Broderip many years ago published in the "Zoological Journal" an interesting account of an experiment made by Professor Buckland to ascertain how the Hedgehog deals with a prey apparently so formidable as a Snake. He says:—"The Professor procured a common Snake, and also a Hedgehog, and put them into a box together. Whether or not the former recognised its enemy was not apparent; it did not dart from the Hedgehog, but kept creeping gently round the box; the Hedgehog was rolled up, and did not appear to see the Snake. The Professor then laid the Hedgehog on the Snake, with that part of the ball where the head and tail meet downwards, and touching it. The Snake proceeded to crawl; the Hedgehog started, opened slightly, and seeing what was under it, gave the Snake a hard bite, and instantly rolled itself up again. It soon opened a second and again a third time, repeating the bite; and by the third bite the back of the Snake was broken. This done, the Hedgehog stood by the Snake's side, and passed the whole body of the Snake successively through its jaws, cracking it, and breaking the bones at intervals of half an inch or more, by which operation the Snake was rendered motionless. The Hedgehog then placed itself at the tip of the Snake's tail, and began to eat upwards, as one would eat a radish, without intermission, but slowly, till half the Snake was devoured. The following morning the remaining half was also completely eaten up." According to the statements of some observers, the Hedgehog will destroy not only the harmless common Snake, but also the Viper, and Professor Lenz has described in great detail the mode in which the Hedgehog disposes of this formidable antagonist. The strange part of his account is that the Hedgehog pursues the Viper for some time, smelling at it and licking it, and submitting to repeated bites from the venomous reptile before proceeding to extremities. It then kills the Viper by crushing its head, and proceeds to devour it from that end, without showing any signs of being injured by the poison of the Snake. This curious immunity is said to extend also to other poisons, some of which are at least doubtful; but it seems certain that the Hedgehog will devour the ordinary Blister Beetles (*Cantharides*) without inconvenience, although a very small dose of them would destroy much larger animals. Tschudi, however, has remarked that the acrid liquid secreted by the skin of Toads is disagreeable to the Hedgehog; in eating a Toad he rubs his muzzle on the ground after each bite.

From the narrow point of view of usefulness to man, we may up to this point have a very favourable opinion of the Hedgehog, but he has some other peculiarities which may perhaps be regarded as drawbacks. One of these is his attacking young game, and another his fondness for eggs. One of the editors of Bell's "British Quadrupeds" mentions an instance of the capture of a young Hare by a Hedgehog. A Hedgehog has also been caught in the act of worrying a young Rook which had fallen from the nest; and the general testimony of sportsmen and gamekeepers is to the effect that no small and young animals will come amiss to the Hedgehog. There is also no doubt that the Hedgehog will feed on the eggs of birds wherever it finds them; and it is even stated that it will make its way into a fowl-house, turn the hen off her eggs, and devour the latter.

The diet of the Hedgehog does not appear to be exclusively of an animal nature; in confinement it will feed readily on soaked bread and on cooked vegetables, and in a natural state it is said to eat the roots of plants and the fruits that fall from the trees in gardens and orchards. Gilbert White says:—"The manner in which they eat the roots of the plantain in my garden is very curious; with their upper mandible, which is much longer than their lower, they bore under the plant, and so eat the root off upwards, leaving the tuft of leaves untouched." Some writers have believed that the Hedgehog is so fond of fruit as actually to climb the trees, knock off apples and pears, and then throwing itself down upon them so that they may stick to its spines, walk off quietly with its booty to some quiet retreat. According to Ælian, the ancient Greek Hedgehogs played a somewhat similar trick with figs.

With all this, we have not quite done with the diet, real or supposed, of this curious little animal. It is a common belief in most parts of England that the Hedgehogs will visit the Cows during the night and suck their milk, leaving but a scanty supply for the milkmaid in the morning. There seems, however, to be no satisfactory evidence of the commission of this crime.

When disturbed in its excursions the Hedgehog has the habit of rolling itself up into a ball, with the head and legs tucked carefully away under the belly, and the whole exposed surface completely enclosed by the spiny skin of the back. This is effected by the contraction of a most complicated system of cutaneous muscles, the most important of which, called the *orbicularis panniculi*, forming a broad band encircling the body, draws together the edges of the spiny part of the skin towards the centre of the ventral side of the body, thus forming a sort of prickly bag within which the whole body and limbs of the animal are enclosed. When thus arranged, by the action of the cutaneous muscles the whole of the spines of the upper surface are strongly and firmly erected, making a fence which suffices to protect the Hedgehog from the attacks of nearly all his enemies. Scarcely any Dogs can be found with pluck enough to make a successful attack upon a rolled-up Hedgehog, although it is said that some Dogs and Foxes have a trick by which to get at him, founded on the fact that a jet of water poured into the small aperture within which the head of the animal is concealed will cause him to unroll himself at once. The same power of contraction serves the Hedgehog in good stead in protecting him from other perils. If he finds himself falling down a precipice or from the top of a wall, or down a very steep slope, he immediately makes himself into a ball, and in this form will fall from very considerable heights (eighteen or twenty feet) without receiving the least injury; indeed, Hedgehogs have been observed more than once voluntarily to throw themselves down considerable distances, contracting in this fashion. On reaching the bottom they simply opened themselves, and walked off none the worse for the fall.

The voice of the Hedgehog is a sound intermediate between a grunt and a squeak; Shakespeare, as is well known, calls it "whining." When kept in houses for destroying insects, it is said frequently to make itself disagreeable by its noise at night. In many places, both in England and on the Continent, the Hedgehog is eaten, but chiefly, it is said, by gipsies and tramps. The mode of cooking adopted, we believe, is roasting the animal in his skin, and the flesh is generally said to be excellent. According to M. Cherblanc, the French gipsies envelop the Hedgehogs in a sort of paste of clay, and then cook them over the fire, turning them from time to time until the clay is quite dry and hard, when the roast is considered to be perfect. This earthen envelope is then broken and removed, carrying the spines with it.

Notwithstanding their formidable armour, the Hedgehogs have other enemies besides man. Dogs will attack them, but not often with success, unless we may believe in their employing the *ruse* already alluded to, which is also said to have suggested itself to the cunning mind of Reynard. But the Foxes are said to adopt another mode of dealing with their wished-for prey. When they meet with a rolled-up Hedgehog they will, it is said, roll him along till they come to some water, into which they drop the unfortunate little animal, and then seize him during his struggles to escape drowning. On the continent of Europe the Great Horned Owl or Eagle Owl (*Bubo maximus*) is described as an inveterate enemy of the Hedgehog.

The female Hedgehog goes with young about seven weeks. Before bringing her progeny into the world, she selects some more or less sheltered situation in a hedge-bottom or thicket, or sometimes in a corn-field, in which she constructs a nest of moss and leaves, so well put together, that even

when otherwise unprotected, its roof suffices to throw off the rain. The young, which vary in number from three to seven or eight, are, when first born, about three inches long, white, blind, and quite naked, except that they already possess the rudiments of their spines, which are then quite soft and flexible. In about four-and-twenty hours the spines have grown to a length of one-sixth of an inch, and acquired some hardness. The young animals, according to Gilbert White, have little hanging ears, and he adds that "they can in part draw their skin down over their faces, but are not able to contract themselves into a ball." In about a month the young have acquired nearly the colour of their parents, and are then taken out by the mother to feed, although she still suckles them for a time.

In captivity, if kindly treated, the Hedgehog soon becomes familiar. He takes readily to almost any diet, and, according to Dr. Ball, he will even partake of intoxicating liquors, which, curiously enough, seem to have the effect of making him immediately quite tame, after passing through a period of inebriety, during which his gestures and proceedings have a most ludicrous resemblance to those of a drunken man.

THE LONG-EARED HEDGEHOG.*

This species has the ears much larger and the muzzle longer than in the Common Hedgehog, and its legs also are longer and not so stout. The tail is very short. The spines, which are marked with from twenty to twenty-two little furrows, are white at the base, brown in the middle, and yellowish at the tip; the head is covered with hair of a dirty whitish colour; and on each side of the mouth there are four rows of long brown whiskers. This animal is only about two-thirds the size of the European Hedgehog. It is found in the western part of Asiatic Russia, especially about the Caspian, in Tartary, and Siberia. It does not occur in Persia, according to Mr. Blanford, although included by Schmarda in his list of the animals of Mesopotamia. It inhabits the province of Astrakhan, in south Russia, which makes it a European species. Very little is known of the habits of the Long-eared Hedgehog, but from that little it would appear to agree in most, if not all respects, with its European relative.

Several other species of Hedgehogs have been described, the majority of them from the Asiatic continent, reaching even to the district of the Amoor, from which Schrenck described one under the name of *Erinaceus amurensis*, which is supposed by Mr. Bell to be a variety of the Common Hedgehog. Mr. Blanford describes a peculiar Persian species with large ears and long spines (*E. macracanthus*). and Mr. Blyth another from Candahar (*E. megalotis*). Several Indian species are noticed by various authors, and some of these seem to be widely distributed, such as

THE COLLARED HEDGEHOG,†

whose range extends from Madras to Candahar and Afghanistan. It is about eight or nine inches long, and has the spines irregularly interwoven, ringed with white and black, with the tips yellow, or simply white and black, or black with a white ring in the middle; the ears, which are tolerably large, and the chin, are white; and the belly and legs pale brown.

Of this, and two other species observed by him in Candahar, Captain Hutton says:—"They are nocturnal, and during the day conceal themselves in holes, or in the tufts of high jungle grass. Their food consists of insects, chiefly of a small Beetle, which is abundant on the sandy tracts of Bhawlpore, and belongs to the genus *Blaps*. They also feed on Lizards and Snails. When touched they have the habit of suddenly jerking up the back with some force, so as to prick the fingers or mouth of the assailant, and at the same time emitting a blowing sound, not unlike the noise produced when blowing upon a flame with a pair of bellows." They have as complete a power of rolling themselves into a ball as the European Hedgehog.

One species of the genus, the Concolorous Hedgehog (*E. concolor*), appears to be peculiar to Asia Minor; others are found in Egypt, Algeria, the Sahara, and other parts of North Africa; and two are recorded from the Cape of Good Hope.

* *Erinaceus auritus.* † *Erinaceus collaris.*

THE BULAU.*

We shall find, as we advance with our examination of the Insectivorous Mammals, that the characters presented by these creatures, especially in their anatomical structure, are in many instances so curiously combined that it becomes a matter of considerable difficulty to decide to what particular family a given animal should be referred, the external and structural peculiarities often pointing in two different directions, but generally tending in a remarkable manner in these anomalous forms towards the great family of the Shrews, which may be regarded as the central types of the whole order. This is the case with the Bulau (*Gymnura Rafflesii*), a curious animal which was originally discovered in Sumatra by Sir Stamford Raffles, and described by him as a Civet, under the name of *Viverra gymnura*. Vigors and Horsfield in England, and Lesson in France, recognised its distinctness from the Civets, and formed it into a separate genus under the name of *Gymnura*, designating the species after

BULAU.

its discoverer, and this name has been generally adopted, although De Blainville afterwards proposed to call the genus *Echinosorex*, and to retain Raffles' specific name.

De Blainville's name may be taken to express in general terms the peculiar characters of the animal, which is a Hedgehog-like Shrew, or a Shrew-like Hedgehog, the latter being the more correct term. The Bulau, as Professor Gervais says, is "a Hedgehog, with the body, and especially the head, more elongated than in those already described, with flexible hairs, and furnished with a tail which is nearly naked, and as long as the body." It has also a larger number of teeth, there being forty-four in all, namely, on each side, in each jaw, three incisors, one canine (that in the upper jaw with two roots), and seven premolars and molars which closely resemble those of the true Hedgehogs. On the back a few stiff bristles are mingled with the softer hairs, as if to give a sort of indication of the animal's relationship to the Hedgehogs; but it has no power of rolling itself up into a ball.

The Bulau has a long, round, tapering, scaly tail, almost like that of a Rat, but with a greater number of scattered stiff hairs among the scales. Its head is long, and its muzzle produced into a short proboscis. Its legs are rather short, and its feet, which are adapted to plantigrade progression, are furnished with five toes, each armed with a curved and pointed claw. The general colour of the body and limbs is black or greyish-black, with the head and neck pale or whitish, and with a black streak

* *Gymnura Rafflesii.*

1. TENDRAC. 2. TELFAIR'S TENDRAC. 3. TANREC.

over each eye; the tail is blackish at the base, whitish at the tip. The length of the Bulau is about twenty-six inches, of which the tail occupies twelve. Besides Sumatra, this curious animal, which may be regarded as a connecting link between the Hedgehogs and the Shrews, has been met with in the peninsula of Malacca, and in Borneo, and the neighbouring island of Sarawak. The specimens from Sarawak and the mainland of Borneo opposite Labuan are said by Dr. Günther to be all white, with only a portion of the longest and strongest hairs on the body black. Of the habits of the Bulau nothing appears to be recorded.

Professor Gill is inclined to place that almost equally curious animal, *Urylomys suillus* (see p. 350), in juxtaposition with the Bulau.

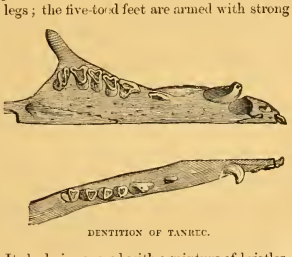
FAMILY V.—CENTETIDÆ, OR TANRECS.

The animals of this family usually have the back more or less armed with fine spines or bristles among the softer hair, the legs short, the feet five-toed, plantigrade, and the tail very short or altogether wanting, except in one anomalous genus. They are all furnished with external ears. The skull is rather elongated, approximately cylindrical, and has no zygomatic arches. The tympanic bone does not form a bubble-like protuberance; and the molar teeth are narrow, and form more or less regular triangular prisms. The number of teeth is variable. The clavicles (collar-bones) are well developed; the two bones of the shank (*tibia* and *fibula*) are separate; and the intestine has no cæcum.

With the single exception of the curious genus *Solenodon*, the position of which was long regarded as very doubtful, but which is now placed in this family, the Centetidæ are confined to the Madagascar region, which bears so many other peculiar types of animals. Their food appears to consist chiefly of worms and insects, but doubtless, like their relations the Hedgehogs, they will seize upon any small animal that comes in their way. The species are not numerous.

THE TANREC.*

The Tanrec, or Tangue, which is the best-known species of the family, is entirely destitute of tail. It has a long, pointed muzzle, small ears, and short legs; the five-toed feet are armed with strong claws, and the body is not capable of being contracted into a ball; the angle of the lower jaw is slightly bent inwards; and the teeth are forty in number, there being on each side, in each jaw, three incisors, one canine, three premolars, and three true molars. The canines, both above and below, are of exceedingly large size; those of the lower jaw are received into deep pits in the sides of the intermaxillary bone; while those of the upper jaw project downwards on each side of the lower jaw. These are the characters of the genus *Centetes*.



DENTITION OF TANREC.

The Tanrec (its figure will be seen in Plate 11) measures about fifteen or sixteen inches in length, of which nearly one-third is made up by the elongated head. Its body is covered with a mixture of bristles, hairs, and more or less flexible spines, the latter being especially strong about the nape and sides of the neck, where they measure about one-fifth of an inch in length, and form a sort of crest or collar. The spines are longer and more flexible on the body, where they are mixed with bristles, which prevail especially on the back, and these measure sometimes as much as two inches long. The belly and limbs are clothed with short hair. All these dermal appendages are yellowish, with the middle brown, giving the animal a general tawny colour, which is paler or yellowish on the limbs. The face is brownish, and the long whiskers which spring from each side of the muzzle are of a dark brown colour. This is the general coloration of the species, which, however, varies occasionally. The young are said to be brown with yellow longitudinal streaks, which disappear with age.

* *Centetes ecaudatus.*

This animal occurs abundantly not only in Madagascar, but also in the small islands of Nossi-falie, Nossi-bé, and St. Marie, and it has been introduced into Mayotte, Réunion, and the Mauritius. It passes one-half of the year in a state of torpidity, and this not in the hot season, as has been supposed, but in the colder part of the year. About May or June the Tanrecs dig themselves holes, in which they sleep until December, with their heads comfortably tucked away between the hind legs. Their burrows are generally betrayed by the presence of a small heap of earth or moss thrown up at the entrance, and as the animals are at this time very fat, and regarded as great delicacies by the natives of Madagascar and the Creoles of Réunion, they are then pursued with great avidity. Their flesh is said by some people to be preferable to Sucking-pig; but others complain that it has a musky flavour. In Madagascar the inhabitants hunt the Tanrecs with Dogs trained expressly for the purpose.

The number destroyed for food seems to be very great; but the fecundity of the animal is such as to compensate even for this violent persecution. The female is said to produce from twelve to sixteen young at a birth, and she is described as taking the greatest care of her progeny. As soon as the young Tanrecs can run about, she takes them with her in search of food, and will then defend them bravely against every danger, allowing herself to be killed rather than be separated from her family.

The Tanrecs—or Tangues, as they are called by M. Pollen—live chiefly in the mountains, in places covered with mosses, ferns, and bushes. Their food consists principally of earthworms, which they rout out by means of their feet and pointed snouts, using the latter after the fashion of a Pig. Insects also form a part of their diet; and, like the Hedgehog, they are said to feed upon certain fruits and roots. In captivity they will eat raw meat, and are also said to be fond of bananas. Their habits are nocturnal; they sleep nearly all the day, and come forth in full activity only at night.

Several other supposed species of this genus have been described, but only one of them appears to be really distinct, namely, the Streaked Tanrec (*C. semispinosus*), which is described as about the size of a Mole, and streaked with black and yellow. It also inhabits Madagascar. It forms the genus *Hemicentetes* of Professor Mivart.

THE TENDRAC.*

An animal much more like a Hedgehog than the preceding, having the body covered with spines almost as formidable as those of the Common Hedgehog, and also possessing the power of rolling itself into a ball, is the Tendrac of Madagascar (its figure will be seen in Plate 11). It has been formed into a separate genus (*Ericulus*), distinguished by the above peculiarities, by the presence of only two pairs of incisor teeth in each jaw, by its canine teeth possessing two roots and a second small cusp to the crown, and by its possession of a short tail like that of the Hedgehog. The total number of teeth is thirty-six. The Tendrac is about one-third less than our Common Hedgehog, which it closely resembles in appearance, and in the form of its muzzle, ears, tail, and feet. Its general tint is blackish, its spines being black, with the tips white or reddish. In its habits it resembles the Tanrec.

Telfair's Tendrac (*Echinops Telfairi*) is another little Hedgehog-like inhabitant of Madagascar, where, according to Mr. Telfair, its discoverer, it goes by the native name of *Sokinah* (its figure will be seen in Plate 11). In its general characters it closely resembles *Ericulus*, but has only two premolars on each side in each jaw, and the two intermediate upper incisors are much longer than the others. It is the only known species of its genus. Its length is about five inches; it has a short pointed snout, a very short tail, and ears of moderate size, and rounded; its colour above is brownish, and beneath dingy white, and the upper surface is thickly covered with sharp spines, which are whitish at the base, and chestnut brown at the tips. All the feet are five-toed.

THE RICE TENDRAC.†

In 1870, M. Grandidier described a small Tendrac which he had obtained at Ankaye and Antsianak in Madagascar, and which he says inflicts enormous injury upon the rice-crops, by burrowing in the earth, and rooting up the young plants. The native name, "vakavou fontsi," is said

* *Ericulus spinosus.* † *Oryzorictes hova.*

to refer to this destructive habit of the animal, and, we presume, has the same meaning as the name given by M. Grandidier to the genus which he established for it.

The Rice Tendrac has the snout produced into a short trunk, at the extremity of which the nostrils are situated. The eyes are very small, and the ears rounded and of moderate size. The teeth are forty in number, as in the Tanrec. The animal is plantigrade; the hind feet have five, and the fore feet four toes, and those of the latter are armed with very strong curved claws, which are doubtless of great service in the burrowing operations alluded to above.

The Rice Tendrac is of a greyish-brown colour. Its tail is short, clothed with long hairs at the base, but naked in the last two thirds, which exhibit a ringed appearance. It must be abundant in Madagascar, but M. Grandidier records nothing of its habits beyond the charge he makes of injury to the rice-crops. This is no doubt effected by the animal when burrowing in pursuit of insects and worms.

THE EARED EARTH SHREW.*

The curious series of animals included under the family Centetidæ is united in a remarkable manner by the intervention of a little creature about the size of a Mouse, discovered in Madagascar, and described by MM. A. Milne-Edwards and Grandidier under the name of *Geogale aurita*. At the first glance it might be taken for a true Shrew. It has a long head, although the snout is not prolonged, the nostrils open at the sides of the nose; the mouth is large, the ears are of large size, membranous, and naked, and apparently capable of folding up at the will of the animal so as to close the aperture of the ear, and the tail, which is shorter than the body, is covered with a finely-ringed skin, over which are scattered very short brownish hairs. These characters, as is remarked by the describers, give the animal somewhat the aspect of a little Opossum. The teeth are thirty-four in number; there appear to be six incisors in each jaw; the canines are very small, and the molars especially resemble those of *Solenodon*.

This little animal has the upper part of the body and head rather thinly covered with short greyish hairs, and the lower parts greyish-white. The sides of the muzzle bear long, brownish moustaches. Specimens were obtained in two localities in Madagascar (Mouroundava and Tullear), and in both cases they were found in the ground disturbed by pulling up the posts of a palisade, so that it may be inferred that this species hunts worms and larvæ in the earth, an operation in which the faculty of folding the external ears over their orifice would certainly be useful to it.

THE AGOUTA.†

Several years ago (in 1833) Professor Brandt, of St. Petersburg, described a singular animal from St. Domingo, which was particularly interesting, both as being the only known representative of the Insectivorous Mammalia in the tropical regions of America, and also on account of its own extraordinary character. It was an animal of about the size of a small Rabbit, the head and body measuring about a foot in length, but the muzzle was drawn out into a sort of trunk or proboscis, at the sides of which, near the tip, the nostrils were situated; the body terminated behind in a naked, rat-like tail, rather more than eight inches in length; whilst the feet, which were decidedly plantigrade, and each furnished with five toes, had the latter armed with curved, compressed claws of formidable dimensions, especially on the fore feet. The dentition clearly showed the animal to be insectivorous, but its characters were so peculiar that Brandt seems to have regarded it as a sort of intermediate form between the Shrews and the Marsupial Opossums.

Subsequent investigations have shown that, odd as this animal may be, its place is undoubtedly among the true Insectivora; and Professor Peters, of Berlin, by a consideration of its characters, and especially of those of the skeleton arrived at the conclusion that it is most nearly related to the Tanrecs of Madagascar, widely separated as that land is from the West Indian home of the Agouta.

Professor Brandt established a distinct genus for the reception of the animal described by him, which he called *Solenodon paradoxus*—the generic name referring to the peculiar channelled structure of

* *Geogale aurita.* † *Solenodon paradoxus.*

the outer incisors in the lower jaw—the specific name to the paradoxical nature of the animal itself Professor Peters' interpretation of the dentition, which was long a subject of doubt, is now generally accepted, and according to this, there are in the front of the upper jaw two large, acute incisors, with a smaller one placed a little further back on each side; and in the middle of the lower jaw two very small incisors, with immediately on each side of them one of the large canine-like teeth, with a deep groove or channel on the inner surface, which have already been alluded to. Behind these teeth come in each jaw a canine, four premolars, and three true molars, so that the dental formula, according to this view, is—incisors, $\frac{1-2-1}{1}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{4-4}{4-4}$, and molars, $\frac{3-3}{3-3}$, making forty teeth in all.

The premaxillary bones extend some little distance in front of the roots of the upper incisor teeth, but the nose itself is prolonged considerably beyond them, forming a long, slender proboscis. The eyes are small, and the ears of moderate size, and rounded; the body is covered with rather stiff hairs, which, however, leave the hinder part, from the root of the tail downwards, almost naked; the tail is

THE AGOUTA.

long, tapering, and ringed, with a few scattered, very short hairs; the legs are of moderate length, and the feet, all of which have five toes, are nearly naked, or covered only with short hair.

The Agouta, or *Solenodon* of St. Domingo, has the face, head, and upper parts brown, becoming blackish behind and on the thighs; the sides of the head and neck lighter brown, with a mixture of red and grey; the belly and feet tawny brown; the breast bright rust colour; and the tail greyish towards the base, and white towards the tip.

Of the habits of this animal, long supposed to be the only species of its genus, nothing is recorded; but its teeth very clearly indicate a carnivorous or insectivorous diet, and its habits, in all probability, resemble those of the following species.

THE ALMIQUI.*

In 1838, or nearly five years after the publication of Professor Brandt's description of the preceding animal, Professor Poey, of Havana, detected the existence of a *Solenodon* in some of the mountainous parts of the island of Cuba. He identified it with Brandt's species, and noticed it under

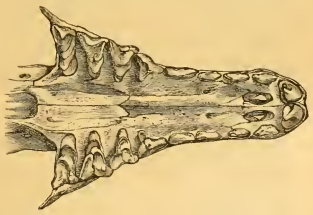
* *Solenodon cubanus.*

the name of *Solenodon paradoxus*, in his "Natural History of Cuba," which appeared in 1851. Later, however, Professor Peters, having procured a specimen from Cuba, and compared it with the one from St. Domingo in the museum at St. Petersburg, found that the two animals were quite distinct, and described the Almiqui of Professor Poey under the name of *Solenodon cubanus*.

The Cuban animal is of nearly the same size as that from St. Domingo, measuring in a straight line from the point of the nose to the root of the tail a little more than eleven inches. Of this the head makes about $4\frac{3}{4}$ inches. The stout, scaly tail is $7\frac{1}{2}$ inches in length. The hairs of the general surface of the body are very long, and form a sort of cloak for the animal, leaving its hinder part bare in a very singular manner. The colours are rather different in the Cuban species. The whole of the head, the neck, the chest, and the sides of the belly are tawny or yellowish, and the rest of the body, a streak on the nape of the neck, and another in the middle of the belly, are brown or blackish-brown. The legs are clothed with hair like that on the body, but shorter; and the upper surface of the feet has a scanty covering of short hairs which allow the skin to appear through them, and even this ceases towards the extremities of the toes. The teats in both species are situated on the groin.

The Cuban *Solenodon* is found in the mountains near Trinidad and Bayamo, in the southern and western parts of the island of Cuba. It is a nocturnal animal, coming forth late in the afternoon or in the evening, and amusing itself with various gambols during the night. It appears to be a predaceous animal, and in captivity shows signs of great excitement when a fowl or other animal passes by its cage. According to one observer, it will tear a chicken to pieces in a moment with its strong claws. At sight of a possible prey the long hair of its body stands on end. When sleeping during the day it seeks some corner in which it can stow away its head, and seems then to think that it is in a place of security, for when pursued it takes refuge in a shelter of the same kind, and will remain there until it is captured by seizing its tail. When disturbed in its repose it expresses its displeasure by grunting; and its ordinary voice, which is said to be very penetrating, is described as something between the grunt of a Pig and the cry of a bird. When enjoying itself at night it sometimes hoots like an Owl.

The occurrence of these two animals in the large West Indian islands is an exceedingly remarkable fact in the geographical distribution of animals, when we consider that in the general opinion of zoologists their nearest relations are the Tanrecs of Madagascar, and the *Potamogale* or River Shrew of some West African rivers. Professor Peters indeed remarks that the circumstance is the less surprising, as a certain type of Iguanidæ, otherwise peculiar to America, is represented in Madagascar, where also are found species belonging to two American genera of Snakes. But this does not explain the phenomenon. Mr. Andrew Murray maintains that the relationship of *Solenodon* is rather with the Shrews than with the present family, and, in fact, that they are peculiar and gigantic Shrews, which would certainly lessen the difficulty, seeing that there are plenty of Shrews in North America; but his arguments are by no means conclusive. Mr. Wallace, alluding to the occurrence in Europe of fossil remains referred to the Centetidæ, regards this as a case of a type formerly very widely distributed being now broken up, and represented only at or near the two extremities of its greatest range.



UPPER JAW OF WEST AFRICAN RIVER SHREW.
(From *Transactions, Zool. Soc.*)

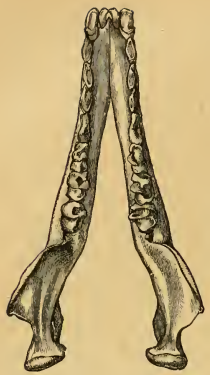
FAMILY VI.—POTAMOGALIDÆ.

This family includes only a single species, so that its characters may be indicated as part of the description of the animal itself, namely:—

THE WEST AFRICAN RIVER SHREW.*

This was originally described by its discoverer, M. Du Chaillu, as a Carnivore, under the name of *Cynogale velox*, but as its characters were very doubtful, the name *Potamogale* was suggested for it in

* *Potamogale velox.*



LOWER JAW OF WEST AFRICAN RIVER SHREW. (From *Trans. Zool. Soc.*)

case of its proving to belong to a distinct genus. The late Dr Gray described it as a Rodent under the name of *Mythomys*. Some years later Professor Allman and Professor Barboza du Bocage procured perfect specimens, and proved the animal to belong to the Insectivora, the latter naturalist describing it under the new name of *Bayonia velox*. Thus within a few years it received no less than three different names.

When the Insectivorous nature of Du Chaillu's River Shrew was ascertained, it was found to be most nearly allied to the Centetidæ or Tanrecs, with special affinities to the West Indian Solenodons. It is, however, generally regarded as constituting a distinct family, characterised among other things by the less cylindrical skull, the absence of clavicles, the union of the two bones of the shank towards the extremity, the presence of anal glands, and the compressed form of the tail. The teeth, as in the true Tanrecs, are forty in number, but the molars differ considerably in form, as will be seen from the annexed figures.

This little beast, that has given rise to so much discussion among zoologists, and received so many names, is only a little larger than our common Stoat, measuring about nine inches in length, exclusive of the powerful tail, which is of about the same length. In its appearance it very much reminds one of a miniature Otter, from which, however, it differs considerably in the form of the head, which terminates

WEST AFRICAN RIVER SHREW. (From the *Transactions of the Zoological Society.*)

in a broad flattened muzzle, having its sides furnished with a most luxuriant crop of stiff bristle-like whiskers. The hair of the upper part of the body and limbs is brown and soft, although rather coarse

and that of the lower surface yellowish; and the coat consists of two kinds of hairs, namely, an inner coat of very fine short silky hairs, through which longer hairs of a very peculiar structure project. These long hairs are very thin at the bulb, and increase very gradually in thickness for about one-third of their length, when they suddenly contract a little, and then expand into a flat lance-shaped blade, which terminates in a very fine point. This coarser fur covers the whole body, the thick root of the tail, and the upper part of the limbs; the rest of the tail, the under side of the muzzle, and the upper surface of the feet are clothed with short, close hairs. The ears are of moderate size, the eyes very small, and the toes on all the feet five in number, armed with small sharp claws, and without webs, but the second and third toes on the hind feet are united as far as the end of the first phalanx.

The most remarkable peculiarity of the animal is its tail, which presents a most unusual development for an Insectivorous Mammal. Professor Allman says, "It is so thick at its base that the trunk seems uninterruptedly continued into it; but it soon becomes laterally compressed, and then grows gradually thinner and narrower towards the tip. . . . . Its lower edge is rounded, and its upper is continued into a membranous crest about one-eighth of an inch in height, and clothed with the same short, stiff, appressed hairs" as the rest of the tail.

This great development of the tail might of itself convince us that this organ is of great service to its owner, and such, from the account of the habits of the animal given by its discoverer, is evidently the case. M. Du Chaillu says:—"This extraordinary animal is found in the mountains of the interior, or in the hilly country explored by me north and south of the equator. It is found along the water-courses of limpid and clear streams, where fish are abundant. It hides under rocks along these streams, lying in wait for fish. It swims through the water with a rapidity which astonished me; before the fish has time to move it is caught. On account of the rapidity of its movements, I have given it the specific name of *velox*. The animal returns to land with its prey almost as rapidly as it started from its place of concealment. The great motive power of the animal in the water seems to be in its tail."

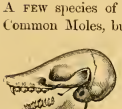
CHAPTER II.

GOLDEN MOLES—MOLES—DESMANS—SHREWS.

General Description of the Golden Mole Family—Their Points of difference from the True Mole—The Cape Golden Mole—Its Varieties—The Family of True Moles—The Common Mole—Described—Distribution—Teeth—Fore-limbs—Breast-bone—Not a Miserable Creature—Extreme Voracity—Diet—His Blindness a Popular Error—A Thirsty Soul—His Fortress—The Roads leading to it—Speed of a Frightened Mole—"Mole-hills"—A wooing—His Strong Family Affections—His Persecution a Doubtful Benefit—The Blind Mole—Several Allied Species—The Star-nosed Mole—Its Snout—The Common Shrew Mole—Other Species in the United States—The Family of Desmans—The Desman—Its Otter-like Habits—Its Trunk—The Pyrenean Desman—The Hairy-tailed Mole-Shrew—The Family of Shrews—The Common Shrew—Or Shrew-Mouse—Superstitions about it—Dekay's Shrew—The Garden Shrew—The Tuscan Shrew—The Rat-tailed Shrew—The Water Shrew—Essentially Aquatic—Its Prey—Allied Species—The Tibetan Water Shrew—The Tailless Shrew—Concluding Remarks—Classification—Distribution—Affinities.

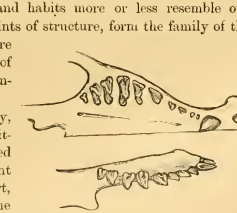
FAMILY VII.—CHRYSOCHLORIDÆ, OR GOLDEN MOLES.

A few species of Insectivora, which, in their general form and habits more or less resemble our Common Moles, but differ from them in several important points of structure, form the family of the Chrysochloridæ, or Golden Moles. They are peculiar to the southern and eastern parts of Africa, ranging from the Cape to the Mozambique Coast.



SKULL OF GOLDEN MOLE.

These animals have a cylindrical body, clothed with a fine, close fur, usually exhibiting a metallic lustre which has been compared to that presented by the feathers of some of the most brilliant birds. They have a conical head, short limbs, a very short, almost rudimentary tail, minute eyes, actually covered by the skin, and no external ears. From the form of the body, the texture of the hair, and the structure of the limbs, they are as evidently organised for burrowing underground as the Moles, with which they have generally been



DENTITION OF GOLDEN MOLE.

associated; but the structure of the mechanism by which their burrowing is effected is so different that, taken in conjunction with certain other characters, it has led modern zoologists to regard the Golden Moles, notwithstanding their scanty numbers, as constituting a perfectly distinct family of the Insectivora.

The skull is shorter, more wedge-shaped, and more elevated at the back than in the true Moles, and the premaxillary bones form a process which is curiously turned outwards (see figure, p. 365), but this does not run to the extremity of the snout, which is supported by cartilages. The dentition is very peculiar. The total number of teeth is either thirty-six or forty, one species having two molars less in each jaw than the others; the front upper pair are large and pyramidal in form, presenting some resemblance to the corresponding teeth in the Desmans; these are followed on each side by three minute teeth, and these again by five or six true molars, of prismatic form. In the lower jaw there are two pairs of front teeth, followed on each side by three small pointed teeth (premolars), and by four or five true molars.

STERNUM OF GOLDEN MOLE.

The structure of the anterior limb, and of the parts which support it, is peculiar and characteristic, differing materially from that which obtains in the true Moles. In the sternum there are seven similar pieces, which receive the extremities of ribs, and behind these a semi-cartilaginous piece, called the ensiform (or sword-like) appendage. In front of the rib-receiving pieces is a large bone (the *manubrium*), excavated on each side behind to receive the ends of the collar-bones, and furnished along its lower surface with a ridge serving for the attachment of a part of the powerful muscles by which the fore limbs are moved. The form of this part is very different from that of the corresponding piece in the Mole (see p. 368). The form and mode of articulation of the collar-bones (clavicles) is also very different. In the True Moles the clavicle is a short, thick bone, almost resembling the vertebra of a fish; in the Golden Moles it is a longer and more slender bone, of ordinary form, and articulated after an ordinary fashion, both with the sternum and the shoulder-blade. The latter bone is larger than in the Mole, and has a very strong spine, which projects far beyond the articulation of the humerus (arm-bone). The humerus itself is a more slender bone than in the Mole, and more of the ordinary form, although it has a very strong tuberosity near the lower extremity; and one of the carpal bones (the pisiform) is most unusually developed, passing up alongside of the bones of the fore-arm (radius and ulna), until it reaches the humerus. The fore foot is quite different in its construction from that of the Mole. The latter consists of five toes, armed with large flat claws, and forms a shovel-like organ, turned outwards in a peculiar manner. The fore foot of the Golden Mole has only four digits, of which the inner and outer ones (I. and IV. in figure) are small, while the second and third toes (II. and III.) are large and armed with very large claws; the claw-joint of the third, especially, being of enormous size, and cleft nearly to its base. With this powerful instrument the Golden Mole digs his way very readily through the ground, using his hind feet, which have five toes, and much resemble those of ordinary Moles, to push him forward in his burrows.

FORE-FOOT OF GOLDEN MOLE.
(*After Owen.*)

THE CAPE GOLDEN MOLE.*

The Cape Golden Mole is about the size of our Common Mole, or a little more than five inches in length. The colour of its fur is brown, but according as the light falls upon it it shows brilliant golden and iridescent green and purple reflections; a patch round the eye and a streak from the eye to the angle of the mouth are yellowish-brown; and the throat has a greenish tinge. The claws are of a light brown colour.

The Golden Mole inhabits the Cape of Good Hope and Caffraria, where it feeds, like our British Mole, upon insects and worms, which it captures by burrowing through the ground. In the settled districts it is as much disliked as the Mole in Europe, on account of the damage which it does in fields

* *Chrysochloris capensis.*

and gardens by its subterranean activity. Several South African forms, nearly related to the above, but differing more or less in the colour and texture of the hair, have been described as distinct species by various zoologists; but these are now regarded as mere varieties of *Chrysochloris capensis*, which has also received the names of *aurea* and *inaurata*. Besides these, Dr. Günther has described a species from Caffraria, under the name of *C. Trevelyani*, which has the fur brownish and not lustrous, and also presents some minor differences of structure. The Blunt-nosed Golden Mole (*C. obtusirostris*) of Professor Peters, from Mozambique and Caffraria, which has a lustrous coat, has one molar less on each side in each jaw, so that the whole number of teeth is only thirty-six, and hence, and from some peculiarities in the structure of the lower molars, and the absence of a bladder-like enlargement in the temporal fossa, which occurs in the other species, Professor Mivart has placed it in a distinct genus, under the name of *Chalcochloris*.

FAMILY VIII.—TALPIDÆ, OR MOLES.

The True Moles constitute a very distinct family of Insectivora, characterised more especially by their complete organisation for a subterranean life. They have a more or less cylindrical body, with short limbs, of which the front pair are converted into most powerful digging organs, the construction of which will be noticed in the description of our common British species. The head is small, with the muzzle produced and generally pointed, and the eyes and ears concealed, the former being generally almost covered by a membrane; the skull is elongated, rather flat, with a distinct, thin zygomatic arch; the bones of the shank (*tibia* and *fibula*) are united; the wrist has a sickle-shaped bone on the inside, which passes to and helps to support the first digit; and the intestine has no cæcum. The teeth vary somewhat in number.

The Moles usually form a subterranean dwelling which exhibits considerable ingenuity in its construction, and live upon worms, the larvæ of insects, and other small animals which they capture whilst making their way beneath the surface of the ground. They inhabit the northern half of both hemispheres, not a single species being known to occur south of the Equator. The best known species, whose history may serve as a type of that of the family, is

THE COMMON MOLE.*

The Common Mole of Great Britain, although an animal not very often seen, is yet so well known as regards its general appearance that we need hardly describe it. It has a plump, nearly cylindrical body, with very short limbs, a short tail, and a long, pointed muzzle. The eyes are so minute as to escape observation; the external ears are wanting; the body is covered with a velvet-like coat of hairs of a black or blackish-brown colour, with more or less of a whitish tinge in certain lights; and the feet, which are naked, are flesh-coloured. The total length of the animal is usually about six inches, of which not more than half an inch is made up by the tail.

COMMON MOLE.

The Common Mole occurs not only in the British Islands, but across the whole of the central and southern parts of the continent of Europe, extending northwards as far as the southern shore of the Baltic and throughout Denmark, thus justifying Shakspere's allusion to it in "Hamlet." It also stretches

* *Talpa europæa.*

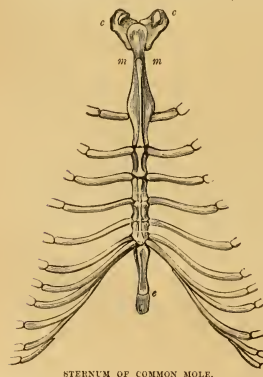
across Central Asia to the confines of China, and according to some writers extends through Persia into India. It is subject to much variation, which may be due to differences of soil or climate. Thus Mr. Bell records Moles "of a deep black colour, of a mouse-grey, dark olive-brown, pied, yellowish-white, and wholly or partially orange;" and mentions specimens from Berne "of the usual dark colour, but having a well-defined lozenge-shaped patch of orange on the breast."

DENTITION OF COMMON MOLE.

The Common Mole is the type of the restricted genus *Talpa*, the species of which are entirely confined to Europe and Asia. In these animals the elongated muzzle projects considerably beyond the opening of the mouth, and contains a pair of long tubular nostrils; it is supported by cartilage, and further strengthened by a small bone at the extreme tip. The teeth with which the jaws are armed are of formidable character, and plainly indicate the predaceous habits of the animal. There are always three true molars on each side in each jaw, and these are armed with several strong points united by ridges, but the number of the other teeth is slightly variable (the total number of teeth ranging between forty and forty-four), and even the determination of their precise nature is somewhat obscure. The dentition of the Common Mole (see figure) is now, however, generally regarded as follows: In the upper jaw, on each side, three incisors, one large canine provided with two roots, and four premolars, of which the hindmost is of large size; in the lower jaw, on each side, four incisor-like teeth, the hindmost of which is probably a canine, and four premolars, the foremost of which is very like a canine. The variation in number is caused by the absence of some of the premolars and incisors of the lower jaw.

FORE-LIMBS OF COMMON MOLE.

The structure of the fore-limbs, and the bones supporting them, in the Mole and its allies, is not only to be regarded as their most distinctive character, but also as furnishing a most striking example of the adaptation of means to ends. The Moles are condemned to live almost constantly underground, and their very existence depends on the facility with which they can make their way through the earth. The fore-feet, by means of which they dig, are accordingly converted into strong, broad, shovel-like organs, armed with broad, flat claws. The five toes of which these feet are composed consist each of two short joints and a long one, the latter making nearly half the length of the organ; and these long joints, which support the claws, are cleft at the tip and grooved underneath to receive an internal process of the nail, which serves to add to its strength and firmness. The bones of the wrist are short and firmly packed together, and from the scaphoid bone springs a long curved falciform bone (*f* in figure), which runs from the wrist to the first toe, which it helps materially to stiffen and support. The arm which supports this powerful hand is also of peculiar construction. In the forearm (*a*) the radius and ulna are distinct, but the acromion (or elbow) process of the latter is very long, and widened at the extremity, giving great power to the action of the limb. The humerus (*b*) is quite different from anything to be met with elsewhere in the Mammalia, being a short and very stout bone, rendered most irregular in its outline by the development of great crests and processes. It not only



STERNUM OF COMMON MOLE.

articulates with the shoulder-blade, but has a separate surface for the reception of the extremity of the collar-bone (*c*), which is a short bone resembling the vertebra of a fish. The shoulder-blade (*d*) is long and narrow, but stout and triangular in its form.

The sternum, or breast-bone, upon which all these parts rest, is scarcely less singular in its structure (see figure). The body of the sternum consists of four short pieces, which receive the ends of the ribs. Behind these is a slender ensiform process (*e*), and in front of them a manubrium (*m*), or presternum, of peculiar form, and quite as long as the whole middle part of the sternum. This part is widened in part of its length, receives a single pair of ribs in its hinder division, has a strong keel for the attachment of the pectoral muscles along its lower surface, and is much thickened at its front extremity, to the sides of which the collar-bones (*c*) are articulated. By this arrangement the whole fore-limb is thrown forward close to the head, and placed in the most favourable position for facilitating the burrowing operations of the animal, which are effected by bringing forward the fore-feet to the level of the nose, and then separating them and pushing backward, with an action that might almost be styled *swimming* through the ground. The hind feet, which are much smaller than those just described, are perfectly plantigrade in their structure. They also contain five toes, armed with small sharp claws, and are used only for the purpose of progression.

When we consider the structure of the Mole, and its perfect adaptation to its mode of life, we may agree with Mr. Bell in the belief that although superficial observers may regard it as a miserable creature, such a notion is an absolute mistake. It is true that the Mole, like so many of our own race, is condemned to almost perpetual exertion; but in the case of human beings we find that physical exertion at any rate is of itself so little of an absolute evil that many of our favourite amusements involve no small amount of it, and moral writers are rather fond of dwelling on the pleasure of earning one's dinner before eating it. Now this is no more than our friend the Mole has to do, so that he can hardly be looked upon as an object either of pity or contempt; and in fact, in his own quiet way, he probably manages to enjoy his life as much as his neighbours. In going about in his subterranean galleries the Mole is constantly engaged in looking out for suitable food, a very large supply of which is necessary for his comfortable existence. M. Geoffroy St. Hilaire says that the appetite of hunger in the Mole is a sort of frenzy, the animal when in view of its prey becoming violently agitated, and throwing itself on its victim as if maddened with rage. Vegetable substances constitute no part of its diet, although it is said sometimes to gnaw the roots of plants in search of the insects and larvæ which feed upon them. Its favourite food consists of earth-worms, in pursuit of which it sometimes comes to the surface so eagerly as to throw itself out of its burrow. It is in search of these animals, and especially of the larvæ of various insects which feed upon the roots of grasses and other plants, that the Mole makes its most superficial galleries.

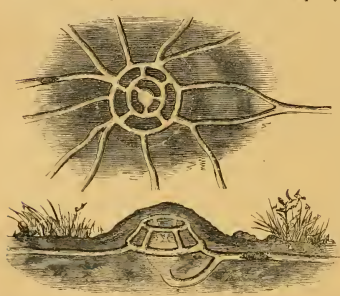
The Mole appears not to be particular in its tastes in the matter of food, and will readily make a meal upon animals much larger and higher in the scale of organisation than those above mentioned, should they happen to come in its way. Mice, small birds, Lizards, and Frogs, if placed within its reach, it will seize and hold with the ferocity and tenacity of a thoroughbred Bull-dog, and even weaker individuals of its own species are killed and devoured. According to M. Geoffroy, in attacking birds it makes use of a good deal of stratagem to get unobserved within reach of its prey, and then by a sudden and violent attack seizes the bird by the belly, tears it open with its powerful claws, and thrusts its muzzle among the unfortunate creature's entrails, with every appearance of intense enjoyment. M. Flourens gives a similar account of its proceedings. Professor Lenz also describes the voracity of the Mole, and its determined mode of destroying larger animals than one would suppose it capable of managing. A Mole in his possession destroyed and devoured, in the course of twenty-four hours, a large Slowworm, a large Snail, two Chrysalids, and a Snake about thirty-two inches long. Of the reptiles he left nothing but the skin and the bones.

It is probably by the sense of smell chiefly that the Mole is guided in its search for prey. Brehm found that when he had got a Mole buried in some earth in a box, and placed a few fragments of chopped meat on the surface, in a few minutes the earth rose, the muzzle of the Mole appeared, and the meat was devoured. The sense of sight is perhaps in general of little use to the animal; but there are times in its life when to see is an advantage; and time-honoured as the belief may be, there is no doubt that the supposition that the Mole is blind is merely a popular error. It has indeed long

been known to naturalists not only that the Mole had eyes, but that these were sufficiently open to enable him to see, and at one time considerable obloquy was heaped upon the memory of Aristotle for having given origin to a statement to the contrary. It would appear, however, that Aristotle's statement was approximately correct with respect to the southern European species upon which his observations were probably made, and the error was that of those naturalists who applied the assertions of the Greek philosopher to a different animal.

Like other great gormandisers, the Mole is an exceedingly thirsty creature. "Where a colony of Moles exists," says Mr. Bell, "a run is always made towards the nearest ditch or pond;" and the same writer states, on the authority of Mr. Jackson, an intelligent Mole-catcher, that where water cannot conveniently be reached, "the animal sinks deep, perpendicular shafts, at the bottom of which water is always found, to which the Mole has easy access. Sometimes, also according to the observations of Mr. Jackson, these wells are full to the brim." These statements are confirmed by a German Mole-catcher, cited by Brehm.

We have already seen that the essential conditions of the Mole's life consist in continual burrowing. Hence, not unnaturally, the animal shows a marked preference for light soils, and through these he makes his way with remarkable ease and rapidity. Oken says of a Mole, which he kept for six months, that when put into a box of sand, it would make its way through the sand almost as quickly as a fish through the water. In its natural mode of life, however, it by no means confines itself to such vagarious proceedings, but constructs a most complex habitation, which is formed with wonderful art.



MOLE'S FORTRESS.

Each Mole has his own encampment, frequently entirely separate from those of his fellows, but sometimes the animals evince a rather more sociable disposition, and condescend to make use of a common passage. But in his encampment, each Mole always has his own dwelling, which has been, not inappropriately, styled his fortress, and this certainly displays great ingenuity and skill in its design and construction (see figure). It is formed under a hillock of earth, in a situation which affords some protection to the little domicile. Its roof is a firm dome, the earth composing it being pressed into a solid mass by the Mole while excavating the internal passages and chambers. Beneath this there are two circular galleries, one above the other, the lower one considerably larger than the upper, with which it communicates by five nearly equi-distant passages, running slantingly upwards. Within the lower circular gallery is situated the actual dwelling-place or chamber, to which access is obtained by three passages descending from the upper gallery, so that when within his house the Mole has to go both up and down stairs to reach his bedroom. But the chamber has another issue by a passage which at first descends for a short distance, and then rises again to lead into the high road running to and from the fortress, which is always single; and, on the other hand, the lower and larger gallery gives off about nine other passages, which either terminate at a short distance from the fortress, or, after making a detour, return into the high road. So cautious is the Mole, that the apertures of these passages are said seldom to be made opposite to those which lead from the lower to the upper circular gallery. With these arrangements it must be confessed that the Mole has provided admirably for being "not at home" to unwelcome visitors.

The same caution that prompts the Mole to the formation of so complicated a castle leads him to take equal care in the construction of the road leading into it. This usually runs in a direct line from one end of the animal's camping-ground to the other, and forms a highway by which he can go quickly about his business. It is large enough to enable him to pass through it easily, but in making it he is careful not to throw out the earth as he does in his ordinary runs, and the whole passage appears to be

chiefly formed by compression of the earth by the little engineer. By his constant passing to and fro, its walls become singularly smooth and compact. Occasionally a Mole will form two or more high roads leading from his fortress, probably when supplies fall short and it is necessary to open up new ground; and sometimes several Moles share the same highway, perhaps in localities where worms and grubs are peculiarly fat and abundant. But in the latter case, as there is not room in the little tunnel for one Mole to pass another, if two of them meet by accident one must give way or retire into a side alley, otherwise a violent combat ensues, when the weaker is ruthlessly killed and devoured. The road varies in its depth from the surface according to the nature of the soil and other circumstances; in safe localities it is usually at a depth of four or five inches.

It is through this well-beaten path that the Mole goes out to his hunting-grounds, and by it also that he is obliged to return. The Mole-catchers are well aware of this peculiarity in the habits of the animal, and one of their most successful devices for its capture consists in placing traps in the course of the high road at a time when the Mole is sure to be out on a foraging expedition, so as to intercept him on his way home. The rapidity of its motion along the high road, especially when alarmed, was demonstrated by an amusing experiment shown to M. Geoffroy St. Hilaire by M. Le Court. The latter, having ascertained the direction of a Mole's road, and found that the animal was hunting at its furthest extremity, placed all along the line at certain distances pieces of straw, passing one end of each into the little tunnel, and attaching little paper flags to the other. He then inserted a horn close to the extremity of the tunnel, and, blowing into it, produced a frightful noise, upon hearing which the Mole naturally made the best of his way home to his fortress, indicating his progress by throwing off the little flags as he passed the successive straws. It was estimated that the speed of the frightened animal was equal to that of a Horse at full trot.

The extreme voracity of the Mole has already been mentioned, but it may be urged in his excuse that the hard labour he has to perform renders a considerable amount of good nourishment absolutely essential to him. Mr. Bell says that his activity in search of food is principally in the morning and evening, and that he sleeps the greater part of the day. In seeking his food, the course adopted by him in making his highway would not answer: he must now dig through the ground to see what it contains, and in doing this he is of course embarrassed by the loose stuff that he dislodges. To get rid of this he makes his way to the surface from time to time, breaks through, and pushes the troublesome rubbish out with his nose, producing those well-known "Mole-hills" of loose earth which so commonly betray his progress in our fields and meadows. The depth at which the Mole works in his hunting-grounds depends very much upon circumstances. In light and newly-worked soils, after rain, when the earth-worms especially come to the surface, the Mole will travel along in a sort of shallow trench in pursuit of his prey. In winter we have the reverse of this picture, for then the Moles are compelled to go far down in pursuit of the worms, which have been driven from the surface by the frost.

It must not be supposed, however, that eating and sleeping make up the whole life-history of the Mole. Very early in the year a time comes when he feels strange emotions stirring within him, and then he goes off gallantly, in his velvet coat, in search of a partner in his lonely encampment. That he will not be allowed to bring home his bride without many an appeal to his weapons is almost a matter of necessity, for by some singular dispensation the number of male Moles is very much greater than that of the opposite sex, a disproportion which, as might be expected, gives rise to a good deal of jealousy and its natural consequences among such fierce and untamed spirits. As the male goes on his wooing he makes numerous but very shallow tracks in all directions. These have received the elegant name of *traces d'amour* from the French naturalists. The lady having been found, the next business is to secure possession of her, and this is attended with considerable difficulties, both from the impertinent intrusion of other males, and from a tendency on the part of the lady herself to run away from the proffered happiness. The intending bridegroom must have rather a hard time of it. But at length the bride's coyness and the assiduities of rivals are got rid of, and the pair settle down to inhabit for a time the same encampment, and to bring up their little family. It would appear that the affection of the male for his mate continues to be of a very warm kind, at least M. Le Court states that he several times found a female caught in a trap with the male lying dead beside her. The possession of strong family affections by the Mole would seem further to be proved by an observation communicated to M. Le Court, according to which, when

the Mole's nest is invaded by a sudden flood, both parents may be seen struggling bravely, and risking their own lives to save their young, and mutually assisting and protecting each other while thus engaged.

The period of gestation in the Mole does not appear to be very accurately known, but it is supposed to be about two months. The young are brought forth earlier or later, according to the season, but most commonly in April. There are generally four or five, but sometimes only three, and occasionally six or even seven in a litter. They are produced in a nest lined with grass, fine roots, dried leaves, and similar materials collected in a sort of chamber, which is formed by the enlargement of the point of junction of three or four of the ordinary passages, always separate from the fortress, and often at a considerable distance from it. Only a single brood is produced in the year.

We have devoted so much space to the natural history of the Mole because, whilst it is really the most interesting, from this point of view, of all our British Mammals, there is no other which is exposed to such constant and severe persecution. In all parts of the country we find professional Mole-catchers, who make it their business to ascertain the habits of the animals, and taking advantage of this knowledge, capture them in great numbers. We shall not attempt to describe the various contrivances used to effect these massacres. It will suffice to state that the principle on which most of them are worked is the insertion into the ascertained run of the Mole of a trap of some kind, which catches him as he is passing. The grounds upon which this war of extermination is waged against the Mole are chiefly the mischiefs which it causes by means of its runs and burrows in fields and pastures; but it may be questioned whether the Mole does not more than compensate for any damage thus produced by the destruction of many insects and other noxious animals.

THE BLIND MOLE.*

We have already mentioned a southern European species which may have given origin to Aristotle's statements as to the blindness of the Mole. This is an inhabitant of Italy, Dalmatia, and Greece, and is said to occur rarely in the south of France, in Switzerland, and in some other parts of Europe. It closely resembles the common species, but has the eyes covered by a membrane pierced only by a minute hole, so that the animal's sole visual consciousness must be limited to a mere perception of light. Its fur is of a deep greyish-black colour; and it differs chiefly from the common European Mole in having the middle upper incisor teeth larger than the rest. In its general habits the Blind Mole agrees with our British species, but it is said to make its runs less extensive and nearer to the surface. Its nest also is said to be made in the chamber within the fortress.

Besides these, several nearly allied species of True Moles are found in northern India, chiefly among the hills, such as the Short-tailed Mole (*Talpa micrura*), in which the tail is exceedingly short, the Long-tailed Mole (*T. macrura*), and the White-tailed Mole (*T. leucura*). The first-named species inhabits Nepaul and Darjeling, and at the latter place, according to Mr. Jerdon, it is not uncommon, and many of the roads and pathways are intersected by its runs, which often proceed from the base of one great oak-tree to that of another. If the runs are broken into they are generally repaired during the night, and no Mole-hills are thrown up like those of the European Mole. The White-tailed Mole differs from the other species in having only three premolars on each side in each jaw, making forty teeth in all. Upon this ground Mr. Gill establishes the genus *Parascaptor* for it.

Still further east, in Japan, we find the Woogura Mole (*Talpa woogura*), which resembles the European Mole in general form and habits, but has the fur of a dingy tawny colour, and the nose unusually produced. In this species there are two incisors less in the lower jaw than in *T. europæa*, and M. Pomel forms for it the genus *Mogera*.

The Abbé Armand David, during his travels in Chinese Mongolia, discovered a Mole closely resembling the European species in its general appearance and characters, which has been called the Musky Mole (*Scaptochirus moschatus*). It was found, however, to possess one premolar less on each side in each jaw than the True Moles (*Talpa*); and from certain peculiarities in the form of the teeth M. Milne-Edwards infers that the animal is less exclusively insectivorous than the Common Mole. It is remarkable for the strong musky odour which it diffuses. The Musky Mole has fur even softer than that of the European Mole, of a bright greyish-brown colour with a tawny tinge, and presenting a brilliant

* *Talpa cæca.*

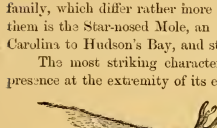
lustre. The muzzle is shorter than in the European Mole, and no trace either of ears or eyes can be detected externally. The tail is nearly naked, but almost concealed in the hairs of the body. Nothing seems to have been ascertained about the habits of this animal.

The Scaptonyx (*Scaptonyx fusicaudatus*) is another of the curious Eastern forms which so remarkably unite to each other different types of these small Mammals. In its external characters it resembles *Urotrichus*, but it has the dentition of the genus *Talpa*, and the nostrils are not elongated into a proboscis. Its length is about two inches and a half, and the length of its tail about one inch and two-fifths. The fur is thick and soft, and the hairs are blue-black at the base, with a brownish tint towards the tip. The single specimen described was obtained on the borders of Kokonoor and Setchouan, but nothing is recorded of its habits.

THE STAR-NOSED MOLE.*

Besides the Eastern forms to which we have just referred, there are a few American species of this family, which differ rather more decidedly from the ordinary Moles. Perhaps the most remarkable of them is the Star-nosed Mole, an inhabitant of Canada and the United States, extending from South Carolina to Hudson's Bay, and stretching right across the continent, from ocean to ocean.

The most striking characteristic of this animal, which constitutes the genus *Condylura*, is the presence at the extremity of its elongated nose of a sort of fringe of about twenty long fleshy processes, forming a regular star, having the nostrils towards its centre. The names *Rhinaster* and *Astromycter*, both meaning "Star-nose," have been given to the genus by different writers. The name *Condylura* is founded on a mistake, the tail having been supposed to have a knob or knot. The tail is nearly as long as the body, the general appearance of which is mole-like, but the shoulders are stouter and heavier in proportion to the hind-quarters than in our Common Mole, although the digging hands are hardly so powerful. The last phalanges of the fingers are not cleft, as in the Mole. The skull is elongated, and the jaws contain in all forty-four teeth—namely, besides canines, three incisors, four premolars, and three true molars on each side in each jaw. The arrangement of the teeth in the long jaws is rather peculiar. In the upper jaw the two middle and the two outer incisors are of large size, and the latter are quite like canines; between them is a third minute tooth on each side. The true canine is very small; the first three premolars are thin and sharp, and the fourth much larger than the rest. In the lower jaw we find four projecting incisors, and behind the outer ones on each side a much smaller one, followed at an interval by a small canine with two roots. The eyes are very minute, and there are no external ears.



SIDE VIEW OF SNOUT OF STAR-NOSED MOLE.

FRONT VIEW OF SNOUT OF STAR-NOSED MOLE.

This curious little animal, which measures about five inches in length, and has a tail about three inches long, is of a brownish-black colour, a little paler beneath, but appearing in certain lights perfectly black throughout. The naked, or nearly naked parts, such as the nose, with its singular appendages, and the feet, are generally of a flesh-colour, the tips of the fringes and of the claws being, in fact, quite rosy. The tail is well covered with hair.

The Star-nosed Mole, like the other members of its family, lives beneath the surface of the ground, where it is able to burrow rapidly in soft earth. It prefers the vicinity of brooks or swampy places. The galleries do not run so near the surface as those of the Common Shrew Mole of America. The nest is composed of dried grass, and placed in an excavation made under some protective object, such as a stump or the root of a tree. The young show scarcely any trace of the nasal appendages. The precise use of these curious organs in the adult does not seem to be ascertained; probably they aid as sensory organs in the discovery of the worms and larvæ of insects on which the creature feeds.

THE COMMON SHREW MOLE.†

The Shrew Mole, which is often called simply the Mole in the United States, is another very widely-distributed species in North America, throughout the whole eastern part of which it is found

* *Condylura cristata.* † *Scalops aquaticus.*

abundantly. Like the other species of its genus, which inhabit the territories farther west, the Common Shrew Mole has an elongated, slender snout, which is cut off obliquely at the end, so that the nostrils, which are situated in this sloping surface, are turned forwards and upwards, and are not visible from below; a short and nearly naked tail; and only thirty-six teeth, which present the following characters:—In the upper jaw there are on each side three incisors, of which the foremost is very large and pyramidal, whilst the other two are very small; then four compressed teeth, gradually increasing in size, of which the first may be regarded as a canine and the rest as premolars; and beyond these three large, true molars, each having the crown furnished with strong cusps, and distinctly divided into two parts. The lower jaw has only four instead of six incisors, and these are nearly horizontal, and the two inner ones are much smaller than the outer; these are followed immediately by three simple, gradually increasing teeth, regarded as premolars; and these again by three large true molars. According to this interpretation there are no lower canines. The feet are like those of the Mole, but the toes of the hind feet are webbed.

Two other species of *Scalops* are found in the western parts of the United States. One of them, the Prairie Mole, or the Silvery Shrew Mole (*S. argentatus*), which is about seven inches long, and has the hairs annulated with white and lead colour, giving it a silvery appearance, inhabits the western prairies, advancing as far to the eastward as Ohio and Michigan; the other, the Texan Shrew Mole (*S. latimanus*), which is still larger, and has the fore feet broader than in any other species, and the black hair longer, thinner, and slightly crisped, is a native of Mexico and Texas.

Two other Shrew Moles have been formed into a distinct genus (*Scapanus*) by M. Pomel. They resemble the preceding in general characters, but agree with the Star-nosed Mole in having forty-four teeth. These are Brewer's Shrew Mole (*Scapanus Brewerii*), a black species, about six inches long, which inhabits the eastern United States, and is supposed to have given the foundation for the reports of the existence of the Common Mole in North America; and the Oregon Mole (*Scapanus Townsendii*), a considerably larger species, which is said to extend all along the Pacific coast, from California to 47° 10′ N. lat. In their habits these animals seem to agree closely with the Star-nosed Mole. The western species occurs abundantly in the banks of rivers.

FAMILY IX.—MYOGALIDÆ.—THE DESMANS.

Some very curious and interesting animals, placed with the Shrews by some zoologists, and with the Moles by others, may, perhaps, for our purpose, be best placed as a distinct family. The Desmans are, in fact, Shrew-like animals, with some important points of resemblance to the Moles. Thus, the teeth in the true Desmans are forty-four in number, and the large upper front incisor is pyramidal, and rather resembles that of some Moles than that of the Shrews; the general character of the skull is Mole-like, especially the presence of a slender zygomatic arch, which does not exist in the Shrews; the shoulder-blade is long, narrow, and strong, the collar-bone short and stout, and the front portion of the sternum is slightly keeled. Many other slight osteological peculiarities point to an alliance with the Moles; but on the other hand, Shrew-like characters are not wanting, and the general structure of the body and limbs is that of the Shrews, the tail being well developed, and the limbs all formed for walking. In the true Desmans the hind limbs are considerably larger than the fore-limbs, and all the feet are palmated, or have their toes united by webs.

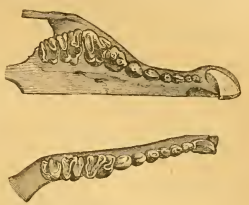
THE DESMAN.*

The Desman in general form resembles a big Rat, but with a long snout formed by the nostrils, which are produced in a tubular form, and united in the middle, producing a regular trunk, provided with muscles which enable it to be turned in various directions, and employed as an organ of touch. The tail is compressed, scaly, and nearly naked.

In the arrangement of the teeth we see a considerable resemblance to the Shrew Moles. Thus, in the upper jaw we have the same gigantic front incisors, larger here than in any other species, and these are followed on each side by a series of seven teeth, gradually increasing in size, the first of which is an incisor, the second a canine, and the remaining five premolars. In the lower jaw, there are four projecting incisors, the outer much larger than the inner ones, as in the Shrew Moles, then, on each

* *Myogale moschata.*

side we have six gradually enlarging teeth, a canine, and five premolars. The true molars are three in number on each side in both jaws. They are broad, powerful teeth, with strong acute tubercles, and crowns divided transversely into two parts. The eyes are small, and there are no visible ears.



DENTITION OF DESMAN.

Another peculiarity of these animals is the presence, under the root of the tail, of a large gland, which secretes a substance of a strong musky odour, whence they are sometimes called Musk Shrews. This gland is composed of from twenty to forty lobes, each having a dilated upper part, and a narrow lower portion, and containing in their walls a great number of small secreting sacs.

The Desman, or Wychuchol of the Russians, is an inhabitant of Southern Russia, where it lives in the banks of streams and pools, in the region between the Don and the Volga. It is also said to occur in some parts of south-western Asia. Its body is about ten inches long, and its tail measures about seven inches and a half. The latter organ is narrowed at the root, and then nearly cylindrical for some distance, and finally compressed from near the middle to the extremity, thus forming a most powerful swimming organ, by means of which, aided by the broad webbed feet, the Desman makes its way through the water with great rapidity. The surface of the tail is scaly, with a scanty sprinkling of short hairs, and with a great number of small follicles, which secrete a greasy material.

The body of the Desman is covered with a dense fur, composed of a thick coat of fine downy hairs next the skin, and of longer smooth hairs, which form the outermost coat. It is reddish-brown on the back, ashy-grey on the belly, and shows a silvery lustre in certain lights. The feet are naked and scaly above, and fringed with hairs at the sides. At the eye, and over the auditory aperture, there are whitish spots.

In its habits the Desman is described as greatly resembling an Otter on a small scale. It lives by preference about standing waters and slow streams, especially when these, as is so commonly the case in Russia, are confined by steep banks of considerable height. In these banks it makes its residence, which is something like that of the Otter, consisting of a passage running obliquely upwards from below the surface of the water, often to a length of twenty feet or more, and then terminating in a sort of fortress-chamber, three or four feet above the water level. But this retreat is only occupied by the animal as a resting place; the greater part of its time, both in summer and winter, being passed in the water. Here it disports itself with an agility of which its rather heavy and clumsy figure would hardly appear to give promise; swimming and diving readily, making its way among the water-plants, and seeking constantly for the animals which constitute its food. These are chiefly leeches, worms, and aquatic mollusca and larvæ of insects, but in all probability no small aquatic animal would come greatly amiss. The curious movable trunk with which the animal is endowed is brought actively into play during the search for provisions. It is turned and twisted in various directions, touching the various objects that come in the way, and is used to feel about for prey, which it is said to seize and convey to the neighbouring mouth after the same fashion as the trunk of an elephant. The animal is said frequently to put its trunk into its mouth, and then to cry like a duck; when irritated or threatened, it hisses, and tries to bite. The Desman is supposed to produce more than one litter in the course of the year. It is pursued for the sake of its skin, which somewhat resembles that of the Beaver and Ondatra in its qualities; and great numbers are taken by means of nets, especially in the autumn. Its flesh is uneatable, on account of its strong musky flavour, which is communicated even to that of the carnivorous fishes, such as the Pike, which, being less nice in their tastes, do not object to an occasional Desman.

THE PYRENEAN DESMAN.*

The only other species of Desman is found in the small streams of the Pyrenees both in France and Spain, where it lives after the same fashion as its Russian relative, but is said to feed principally upon

* *Myogale pyrenaica.*

trout. It is much smaller than the preceding species, being only ten or eleven inches in total length, nearly one-half of which is occupied by the long tail. The fur is chestnut-brown on the back, greyish-brown on the sides, and silvery grey on the belly; the upper lip bears some pectinated whiskers, the sides of the trunk are covered with white and the fore-feet with brownish hairs; while the hind-feet are naked and scaly. This animal also diffuses a strong musky odour.

THE HAIRY-TAILED MOLE-SHREW.*

Besides the true Desmans this group is considered to include two or three singular little creatures which lead directly towards the true Moles. One of these is a Japanese species, discovered by Professor Siebold, and described by Professor Temminck under the name of *Urotrichus talpoides*, which we may call the Hairy-tailed Mole-Shrew. It differs from the Desmans, and agrees with the true Shrews in having only two incisor teeth in the lower jaw. There are thirty-eight teeth in all. It is about the size of the common Water Shrew, with the nose greatly elongated, not into a flexible proboscis, but into a snout with the nostrils placed at the sides of the tip; the tail is about an inch long, stout, scaly, and covered with long hairs, which form a tuft; the fur is brown and velvety, and the snout and feet flesh-coloured, and nearly naked.

This animal is common at elevations of from 1,000 to 1,200 feet in the mountains of the southern and eastern parts of Japan, but becomes more rare towards the north. In its habits it resembles the Moles, digging out galleries in the earth, but going down deeper, and rarely if ever forming heaps of loose earth at the surface.

A nearly allied species, Gibbs' Mole Shrew (*Urotrichus Gibbsii*), is found in North America.

Another species, leading more towards the Shrews, was discovered in eastern Tibet by the Abbé David, and described by M. A. Milne-Edwards under the name of *Uropsilus soricipes*, or the Shrew-footed Uropsile. The general characters of the animal are very like those of *Urotrichus*, but it has one premolar less on each side in each jaw, making the total number of teeth only thirty-four. The tail is naked and scaly; and the fur is of a slate-colour, with a slight brownish tinge.

FAMILY X.—SORICIDÆ, OR THE SHREWS.

A great number of small mouse-like and rat-like animals, presenting shades of character which render their classification almost insuperably difficult, constitute the family of the Shrews, which, as we have already stated, may be regarded as representing the generalised or central idea of the Insectivorous Mammal. On all sides the other families include anomalous species, and the characters which distinguish these from their immediate fellows generally tend in the direction of the Shrews.

In these creatures we find a mouse-like body, terminated in front by a small head, with a long pointed muzzle, and behind by a nearly naked, scaly tail of variable length. The eyes are small, as also are generally the ears; the limbs are short, and nearly equal in size; the skull is long and narrow, and has on each side of its base a space not filled up with bone; the teeth are from twenty-eight to thirty-two in number, and the middle incisors in both jaws are very large; the skull has no zygomatic arch or tympanic bony bubble; the bones of the shank (tibia and fibula) are united; and the intestine has no cæcum. On the sides of the body or at the root of the tail the Shrews possess peculiar glands, which secrete a fluid of strong odour, serving no doubt to protect them from many enemies.

The Shrews are distributed over all parts of the Old World and in North America. They live generally on the ground, although some take freely to the water, and they feed upon worms, insects, and other small animals such as they can overcome. The difficulty of classifying these animals to which we have already alluded has led to their being divided into an infinity of generic groups, of which we shall endeavour to illustrate those which are now most generally accepted.

THE COMMON SHREW.†

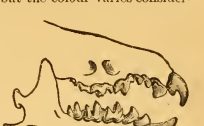
The Common Shrew, or Shrew-mouse, as it is often called, may be noticed first, as being the species most likely to be met with by our readers, in England at any rate. It is one of the species for which the Linnean generic name *Sorex* has been retained, the group as restricted including Shrews

* *Urotrichus talpoides.* † *Sorex vulgaris.*

1. PIGMY SHREW. 2. COMMON SHREW. 3 AND 4. WATER SHREW.

with from thirty to thirty-two teeth, there being four or five premolars in the upper and only two in the lower jaw; with a basal tubercle to the upper inner incisors; with ears of moderate size directed backwards, a long tail, and the feet not fringed with hairs.

Our Common Shrew is a pretty little mouse-like creature (its figure will be seen in Plate 12), measuring about two inches and three-quarters in length, with a tail rather more than an inch and a half long. Its fur is generally of a reddish-grey colour above, and greyish beneath; but the colour varies considerably, being sometimes blackish or chestnut above, and tinged with yellow beneath. The fore teeth are of a rich brown colour. The tail is four-sided,* with the angles rounded off, and is nearly of equal thickness throughout; it is covered with short, close, stiffish hairs. Mr. Bell states that the Shrew sometimes occurs spotted with white, and that he possesses one specimen "which is beautifully pied, having a broad white band over the loins, which extends all round the animal."



DENTITION OF COMMON SHREW.

The food of the Common Shrew consists chiefly of insects and worms, but it also eats the smaller mollusca, and even the common Slug (*Limax agrestis*), according to Mr. Bell, who says that he has not only found the remains of that animal in its stomach, but has also fed it upon slugs in confinement. Like its ally, the Mole, it is very pugnacious, and two Shrews rarely come together without a battle, when the weaker one is killed and eaten. The breeding season of the Shrew is in the spring, when the female makes a comfortable nest of soft dry herbage in some convenient hole in the ground, and there brings forth from five to seven young ones. Their increase is checked to a certain extent by natural enemies. Thus, the Mole is said to kill and eat them when they come in his way; and Cats, Weasels, Owls, and some other animals, will also kill them; and some at least do not disdain to make a meal upon them. The Barn Owl especially seems to make great havoc among the Shrews.

All sorts of evil qualities were attributed to the Shrew by our ancestors, some of which are still believed in. One old writer says that the Shrew-mouse is "a kind of Field-mouse of the bigness of a Rat and colour of a Weasel, very mischievous to cattel; which, going over a beast's back, will make it lame in the chine; and the bite of it causes the beast to swell at the heart and die." The running of a Shrew over the leg of a beast was generally believed to cause the latter great pain, and to produce lameness. The proper cure for these imaginary ills was on a par with the mischief; the remedy was the application to the part affected of a branch or twig of a shrew-ash, which, says Gilbert White, "was made thus: into the body of the tree a deep hole was bored with an anger, and a poor devoted Shrew-mouse was thrust in alive, and plugged in, no doubt with several quaint incantations since forgotten."

There is one circumstance in the natural history of the Shrew that must have struck everybody, although it is still entirely unexplained. This is the death of great numbers of these animals in autumn without any apparent cause. Residents in the country will know that at that season Shrews may be seen lying dead on almost every footpath; in fact, the observation is so general as to have given rise to another superstition, namely, that a Shrew cannot cross a public path without paying the penalty of death. The individuals thus found dead are of both sexes, and of various ages.

The Common Shrew occurs not only in the British Islands, but also over the whole continent of Europe, from Sweden and Russia to the shores of the Mediterranean.

The Lesser Shrew (*Sorex pygmæus*, whose figure will be seen in Plate 12) is a second British species nearly allied to the preceding, but smaller, measuring rather less than two inches in length, and with a proportionately longer tail. The lower parts of the body are also whiter. It is the smallest of British Mammals.†

DEKAY'S SHREW.‡

Some small species of American Shrews agree with the restricted genus *Sorex* in the number of

* Hence the species was called *S. tetragonurus*, by Hermann.

† Two or three other Old World species belong to this group, among which may be mentioned the Alpine Shrew (*S. alpinus*), which appears to range from the Alps to India; and the Blackish Shrew (*S. nigrescens*), a very common species in Sikkim and Nepaul. At Darjeling Mr. Jerdon found many specimens lying dead in the roads without apparent injury. Several allied species also inhabit North America, such as Forster's Shrew (*S. Forsterii*), the Long-nosed Shrew (*S. longirostris*), &c.

‡ *Blarina Dekayi.*

teeth, but have no lobe at the base of the upper incisors; the external ear is small, turned forward, and the tail short, usually not longer than the head. These form the genus *Blarina*.

Dekay's Shrew is about four inches and a half long, and the tail about an inch. Its fur is of a rusty yellow-grey colour above, paler beneath; the nose and feet are reddish-brown, and the front incisors black. From Dr. Bachman's description it would appear that this animal burrows rather deeply in the ground, after the fashion of the Mole. It is found in the northern United States.

THE GARDEN SHREW.*

A very considerable number of Shrews, distributed in all parts of the Old World, and including two or three well-known European species, have been formed into the genus *Crocidura*, which in its turn has been divided again and again by means of characters generally of very slight importance.

The *Crociduræ* have from twenty-eight to thirty teeth, all white, or with white tips; the lower incisors are not toothed; the teeth between the incisors and the molars in the upper jaw gradually decrease in size; and the tail is covered with short hairs, among which there are a good many longer ones.

The Garden Shrew (*Crocidura aranea*) is a small species, usually measuring a little over four inches in total length, of which the tail occupies about an inch and a third. It has twenty-eight teeth which are all white. The fur is of a mouse-grey colour, shading off into whitish ash on the lower surface; the feet are light ashy, with the toes flesh-coloured, as is also the tip of the snout; and the ears, which are well exposed, are ash-coloured above and whitish below. The fur occasionally has a reddish-brown tinge; and, as in the Common Shrew, specimens spotted with white, and even albinos, sometimes occur. This is a common species almost all over Europe, but does not occur in Sweden or in the British Islands. It lives in woods and plantations, in the fields and in gardens, and in the winter approaches close to the houses, sheltering itself under stones and other objects, and sometimes even entering stables and other outbuildings. Like the other species, it feeds upon insects, worms, and other small animals, and like them also it has the reputation of injuring domestic animals by walking over them.

The Tuscan Shrew (*Crocidura etrusca*) is another well-known European species, but its distribution is much more limited than that of the Garden Shrew. It is found generally in the extreme south of Europe, from France to the Black Sea, and also in the north of Africa, but does not appear to extend north of the Alps. Like the Garden Shrew, it frequents gardens, and not unfrequently comes into houses and outbuildings. In the open country it selects dry and warm situations.

The total length of the Tuscan Shrew is from two inches and a half to two inches and three-quarters, and as the tail is nearly an inch long, the head and body may measure little more than an inch and a half. It is the smallest of living Mammals. The teeth are thirty in number. The colour of the fur is ashy with a reddish tinge above, light ashy beneath; the tail is clothed with short hairs, and with a series of rings of longer white hairs; and the ears are of moderate size, projecting distinctly from the fur. In its habits it agrees with the other species.

THE RAT-TAILED SHREW.†

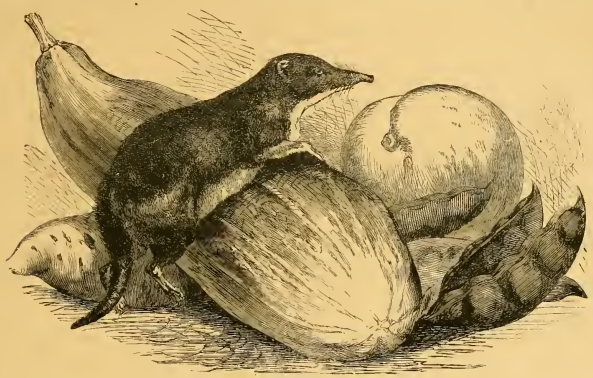
Amongst a number of Indian species, some of which are of doubtful distinctness, we may notice one which seems to be widely distributed in the East, and well known in India and elsewhere, under the name of the Musk Shrew, or Musk Rat. It is usually of a dark brown or even blackish colour above, and much paler beneath, but it varies considerably in this respect, and thus has probably given origin to several so-called species. The ears are of considerable size, and the tail, which is about three-fourths the length of the body, is thickened towards the root—a character of the sub-genus *Pachyura*. The animal is about six inches long. It is a very common Indian species, and frequents houses at night, hunting round the rooms in search of the Cockroaches and other insects which abound there. From time to time it utters a sharp, shrill cry. Its musky odour is exceedingly strong, and is said to impregnate everything that the animal passes over; in fact, the popular belief in India is that in running over a bottle of wine or beer, it is capable of infecting the contents! This, however, is rather more than doubtful. Mr. Jerdon distinguishes two species—an Indian one which he calls *Sorex cærulescens*, which is usually of a bluish ash colour, and a somewhat smaller species, chiefly inhabiting Further India and China, to which he gives the Linnean name of *Sorex murinus*. If they are distinct, it

* *Crocidura aranea.* † *Crocidura myosura.*

is probably to the latter that Mr. Swinhoe refers in his notes on Chinese Mammals under the name of the "Musk Rat." He says that it is found throughout China, Formosa, and Hainan, in houses in large towns, being carried about in junks with the cargo. It has an unpleasant musky odour, and makes a peculiar chattering noise, which sounds like the chinking of money, and, he adds, often disturbed him in his room at night. Such a sound heard in the dark in a strange place would certainly be rather alarming to any one who had money to lose.

The "Musk Rat" of Ceylon is a reddish species, described by Kelaart as *Sorex kandianus*, and by Mr. Jerdon as *S. serpentarius*. It is rather smaller than the preceding, but takes its place in the houses of Ceylon and Southern India, and renders itself equally offensive by its strong musky odour.

Several other Indian species are referred to *Crocidura*, one of which, *C. Perroteti*, is said to be



RAT-TAILED SHREW.

even smaller than the Tuscan Shrew. Others occur in Africa, in Egypt, Mozambique, and Madagascar, and in the neighbourhood of the Cape.

THE WATER SHREW.*

Our British Water Shrew is the type of a distinct genus, all the species of which appear to haunt the margins of water. They have thirty teeth, all of which are tipped with brown or red. The upper front teeth are large and curved, and have a basal cusp behind; the lower ones are nearly horizontal, and have a single tubercle and no notch at the tip. Behind these teeth there are on each side in the upper jaw four small teeth, the last of which is very minute; and in the lower jaw two small teeth. The molars are four on each side in the upper, and three in the lower jaw. The snout is pointed, and furnished with very long whiskers; the eyes small; the ears of moderate size, and valvular; and the feet and lower surface of the tail fringed with stiff hairs.

Our Water Shrew (its figure will be seen in Plate 12), which measures about three inches and one-third in length, and has a tail rather more than two inches long, is generally nearly black on the upper surface and white beneath, the colours being usually separated by a distinct line of demarcation. The hairs fringing the feet and the lower surface of the tail are white. There is, however, considerable variation in the colour of different specimens, some of which have been described as distinct species. One especially, in which the whole of the fur is of a black colour, has been called the Oared Shrew (*Sorex ciliatus* or *remifer*), but the existence of intermediate steps has led to the recognition of the identity of even this with the Common Water Shrew. Mr. Bell is of opinion that the differences of

* *Crossopus fodiens.*

coloration depend on the season and the age of the specimen. The tail is slender, four-sided, and compressed towards the tip. The Water Shrew is distributed over the whole continent of Europe, as far north as the shores of the Baltic. It is found in many localities in England and in Scotland, but is not known to occur in Ireland.

The Water Shrew is one of the prettiest of our British Mammals. Its movements, especially in the water, are very agile; and although, from its swimming by alternate strokes of its hind feet, its course is of a somewhat wriggling character, the peculiar mode in which it flattens its body so as to show a narrow white border on each side, and the silvery lustre of the coat of air-bubbles which adheres to its back, give it a very elegant appearance when thus engaged. It is found chiefly about the rivulets of mountainous and hilly countries, generally showing a preference for those quieter parts where the water flows smoothly over a sandy bottom, but it will also make its way through more broken water, in shallow parts full of stones. Clear water seems to be the great desideratum, and if this can be secured the Water Shrew will put up with a lake or pond. It is not, however, absolutely confined to the water-side, but will at times wander about the fields, sheltering itself under haycocks, and other heaps of dried plants, and even making its way into houses, barns, and outbuildings.

Nevertheless, as may be judged from the fringed tail and feet, it is essentially an aquatic animal, and its regular habitation seems to be always constructed in the immediate vicinity of water. Here the Water Shrew burrows into the soft ground of the bank, and forms a subterranean dwelling, usually with several openings, one of which is situated beneath the surface of the water, to give the little creature an opportunity of slipping quietly and unperceived into or out of its house. Its food is principally obtained in the water, and consists of aquatic insects, worms, mollusca, and crustacea, which it snaps up in its rapid flittings to and fro. In Bell's "British Quadrupeds" the pursuit of the Freshwater Shrimp (*Gammarus pulex*) in a shallow but rapid streamlet by the Water Shrew is described. The little animal was seen busily pushing about among the stones at the bottom of the water, sometimes poking its nose under them, sometimes turning them over in a fashion which might be thought beyond its strength. The result was the same in either case; the Shrew captured some small article of food, with which it made off to the side of the stream, where it was heard crunching the crustaceans between its teeth.

Besides this small prey, the Water Shrew is said by Continental writers to attack almost any small animal that comes in its way—frogs, fishes, and even small birds and quadrupeds are described as among its victims. It is also said to feed on the spawn of fishes, and, according to Brehm's testimony, will even destroy large fish, such as Carp, by eating out their eyes and brains. Carrion and dead animals will also furnish it with a meal. One of Mr. Bell's editors gives a striking instance of this. A steel rat-trap had been set, and in the morning contained a large Rat, "on which was perched a small black object, which proved on closer approach to be a Water Shrew. The Rat was dead, and the Shrew was devouring it. Although the slender snout and projecting and comparatively weak teeth of the Shrew were but ill adapted, one would have thought, for devouring prey of the size of a full-grown Rat, yet the animal had succeeded in making a small hole through the skin, and this it was most energetically employed, by means of both teeth and claws, in enlarging. So ferocious were its actions, that it might very properly be said to be *fighting* the Rat; and so intent was it on its work as to suffer itself to be captured by the observer, who laid the loading-rod of his gun across its back."

The breeding season begins in April or May, when the courtship of the little creatures commences by a persevering pursuit of his intended partner by the male. The lady exhibits a becoming coyness, leading her suitor a long chase through the water; but while thus engaged both parties keep the main chance in view, and seize everything eatable that comes in their way. The young are brought forth in a chamber in the bank, and are from five to seven or eight in number.

A nearly allied, but larger species, the Himalayan Water Shrew (*Crossopus himalaicus*), occurs in the streams of the Himalayas. Mr. Jerdon, who obtained it from the Little Rungeet River at Darjeling, describes it as five or six inches long, dark brown or blackish above, paler beneath, and with a bunch of hairs at the tip of the tail. It was said to kill small fish, tadpoles, aquatic insects, &c. Another species (*C. platycephalus*) inhabits Japan.

The Marsh Shrew (*Sorex palustris*), of North America, has been referred to this genus by some authors; but it has a long slender, cylindrical tail, with a pencil of hairs at the tip, and Professor

Baird refers it to the genus *Sorex*. The teeth are the same in number as in *Crossopus*, and likewise have their tips reddish-brown. This species inhabits the northern parts of North America up to Hudson's Bay Territory.

THE TIBETAN WATER SHREW.*

This is another of the Mammals for the knowledge of which we are indebted to the Abbé David, and it is one of the most curious species of this family, presenting a combination of characters peculiar to itself with those of the True Shrews and the Desmans. "Its head and skull," says M. A. Milne-Edwards, "refer this animal to the *Soricidæ*, whilst its palmated feet and compressed tail indicate close affinities with the *Myogalidæ*; but the sucking discs with which the lower surfaces of its feet are furnished belong to itself alone, and nothing of the same kind is to be found in the allied groups."

In some respects the Tibetan species is allied to the European Water Shrew, but it has only twenty-eight instead of thirty teeth, namely, incisors, $\frac{3-3}{1-1}$, canines, $\frac{1-1}{1-1}$, molars, $\frac{4-4}{4-4}$; the skull is flattened; the body robust, and supported on short limbs; the muzzle short, broad, and conical, with large whiskers at the sides, and the nostrils opening laterally near the extremity; the eyes exceedingly small; and the ears entirely concealed by the hair and quite destitute of a conch. The tail is stout, longer than the body, quadrangular at the base, then triangular, and finally flattened at the sides; and the feet are large and broadly palmated, so as to form vigorous swimming organs, very closely resembling those of the Desmans. As in the latter animals, the feet are fringed with stiff hairs of peculiar construction; but the nails, which in the Desmans are strong, are here small and weak. The sucking discs, already mentioned as peculiar to this animal, are certainly among its most remarkable characteristics. They occur upon the feet of both pairs, and consist of large pads, depressed in the middle to form cups, which are doubtless of service to the animal in its aquatic mode of life.

The Tibetan Water Shrew is rather a large species, measuring, when adult, nearly eight inches in total length, more than half of which, however, is occupied by the tail. It is thus much larger than the British Water Shrew. Its body is covered with hair of two kinds. Close to the skin is a very thick soft down of a slaty grey colour, through which pass numerous longer hairs, which are grey at the base and white at the extremity, causing the animal to vary considerably in appearance, according as these longer hairs are raised or laid flat. The lower parts of the body are white.

In its compressed tail and largely webbed feet this Shrew possesses most admirable instruments for progression in the water; in fact, it must be regarded as the most thoroughly aquatic of all the family of the Shrews. According to its discoverer, it lives habitually on the banks of the impetuous torrents which descend from the mountains of Moupin in Tibet; and notwithstanding the rapidity of these streams, it swims and dives in them with the greatest facility, chasing the small fishes which constitute its principal food. Although not uncommon in its native region, its activity in the water renders its capture exceedingly difficult. In order to procure specimens, it is necessary to divert the course of a stream, and then pursue the animals into the holes in which they take refuge.

THE TAILLESS SHREW.†

Another curious little Mammal, brought from Tibet by the Abbé David, is described by M. A. Milne-Edwards as forming a distinct genus, under the name of *Anurosorex*, or the Tailless Shrew. It has only twenty-six teeth in all, namely, incisors, $\frac{2-2}{1-1}$, canines, $\frac{1-1}{1-1}$, and molars, $\frac{4-4}{4-4}$. The tail is remarkably short, scarcely passing beyond the hairs of the body, slender, slightly flattened, of the same thickness throughout, and covered with small scales, from between which project a few very short hairs. The general form of the body is mole-like, the head is large, the muzzle conical, flesh-coloured, having the nostrils on each side near its extremity, and furnished with long whiskers. The eyes are scarcely perceptible, and the ears are entirely concealed beneath the hairs. The feet are short and scaly, whence the name given to the species, and the fore-feet are broader and stronger than the hind-feet, thus furnishing an additional indication of affinity to the Moles.

This species was found abundantly both in the plains and mountains of Setchouan and Tibet,

* *Nectogale elegans.* † *Anurosorex squamipes.*

where it lives in burrows which it digs in the earth. Its total length is little more than four inches, and its fur, which is very silky and thick, is of a grey colour with a greenish brown tinge. The feet are whitish and the nails white.

In the preceding sketch of the Insectivorous order of Mammals, we have followed in general the classification proposed by Professor Mivart, and slightly modified by Mr. Gill. The following summary of the arrangement will be useful for reference:—

Sub-order I.—DERMOPTERA.

Family 1. Galeopithecidæ.
Genus—Galeopithecus.

Sub-order II.—INSECTIVORA VERA.

Family 2. Tupaiidæ.
Genera—Tupaia, Ptilocercus, Hylomys.

Family 3. Macroscelididæ.
Genera—Macroscelides, Petrodromus, Rhynchocyon.

Family 4. Erinaceidæ.
Genera—Erinaceus, Gymnura.

Family 5. Centetidæ.
Genera—Centetes, Hemicentetes, Ericulus, Echinops, Oryzorictes, Solenodon.

Family 6. Potamogalidæ.
Genus—Potamogale.

Family 7. Chrysochloridæ.
Genera—Chrysochloris, Chalcochloris.

Family 8. Talpidæ.
Genera—Talpa, Parascaptor, Mogera, Scaptochirus, Scaptonyx, Condylura, Scalops, Scapanus.

Family 9. Myogalidæ.
Genera—Myogale, Urotrichus, Uropsilus.

Family 10. Soricidæ.
Genera—Sorex, Blarina, Crocidura, Crossopus, Neetogale, Anurosorex.

Only in one respect have we thought it desirable to depart from Professor Mivart's system, namely, in raising the Desmans (*Myogalidæ*) to the rank of a distinct family. This course was adopted for the sake of simplicity in the classification, as the combination of characters presented by those animals places them so remarkably between the Moles and the Shrews, that from a zoological point of view they cannot satisfactorily be referred to either.

One thing that will strike the reader at once is the great number of family types, for the most part strongly characterised, that can be distinguished in so small an order. Mr. Wallace estimates the total number of species of Insectivora at 135, and of these about 65, or nearly one-half, belong to the single family of the Shrews, leaving about 70 species for all the other families; and of these 34 species, or again nearly one-half, are referred to the two widely distributed groups the Hedgehogs and the Moles.

Considering these facts, and the clear differentiation of most of the forms, notwithstanding the existence of those types already alluded to, which in several of the families seem to lead towards the *Soricidæ*, we can hardly avoid agreeing with Mr. Wallace in regarding the existing Insectivora as "the detached fragments of a much more extensive group of animals, now almost extinct," a view which is strongly corroborated by the geographical distribution of the animals.

Curiously enough several of the smaller and more peculiar families are limited much in the same way as the Pteropine Bats and Lemurs, chiefly to the countries surrounding the great Indian ocean, beneath which, as we have already stated, the hypothetical continent of Lemuria is very probably submerged. The Galeopithecidæ and Tupaiidæ are almost confined to the Malayan region, and the Centetidæ (with the exception of the anomalous genus *Solenodon*) are peculiar to Madagascar; the Macroscelididæ have their home on the eastern coast of Africa, except a single species which occurs in the northern part of that continent; the Chrysochloridæ are exclusively South African; and the curious *Potamogale* inhabits some of the West African rivers. Thus, except in the case of *Solenodon*, the whole of these groups are now represented solely within the region inhabited by the Pteropine Bats. Does this point to a "Lemurian" origin, or at any rate to a great former development in the Lemurian land, of the Insectivorous Mammalia?

Of the more widely distributed families, the Erinaceidæ occur chiefly in the northern temperate regions of the Eastern hemisphere, stretching away continuously from Europe and the North African

deserts, through Asia Minor and Persia, and across Central Asia to the Pacific Coast, whilst one or two species occur in South Africa, and one very aberrant form, the Bulau (*Gymnura*), is found in the Malayan region, along with the Bangsrings, to which it is allied through the genus *Hylomys*. The true Moles and the Shrews occur in the northern parts of both hemispheres, and the latter family, indeed, is represented in all parts of the world except South America and the Australian region. The Desmans, which stand in so peculiar a position between the Shrews and the Moles, present a curious instance of what has been called "discontinuous distribution," the two nearly allied species being found only in two localities, separated from each other by the whole breadth of the European continent. The entire absence of Insectivora from the South American continent, and the presence of the Solenodons, which seem to be most nearly related to the Centetidæ of Madagascar, in Cuba and St. Domingo, are further remarkable facts in the geographical distribution of these animals. Scarcely less singular is the distribution of the two species of *Urotrichus*, one of which occurs in Japan, and the other on the Pacific coast of North America.

The evidence derived from the fossil remains of Insectivora, as to the former history of the order, in its bearing upon the present geographical distribution of its members, is very inconclusive; but the principal facts to be gathered from it is that from Miocene times to the present day the representatives of the order in different localities, so far as these are known, have generally belonged to the same types, and no undoubted remains of Insectivora are known from earlier formations than the Miocene. At one time, indeed, some of the beautiful Mammalian fossils of the Stonesfield slate (Lower Oolite) of Oxfordshire were regarded as probably representing Insectivora, but their Marsupial character is now generally recognised; and this is the case also with the *Dromotherium* from the Trias of North Carolina, which was at one time believed to carry the present order so far back in time.

Species of the existing genera *Erinaceus*, *Sorex*, *Myogale*, and *Talpa*, and of several nearly-allied extinct genera, have been determined from Miocene and subsequent deposits in various parts of Europe, and especially from the lacustrine beds of the Auvergne; and in North America also a few species have been found and referred to genera for the most part almost identical with those still living on that continent. In some instances even the Miocene species appear to be nearly identical with those now inhabiting the same regions.

The principal apparent exceptions to this rule are to be found in a fossil species from the Miocene of the Auvergne, described by M. Pomel under the name of *Echinogale Laurillardi* (Centetidæ), and two forms described by Hermann von Meyer, as forming a new genus (*Oxygomphius*), allied to the Bangsrings, from the Tertiary basin of Weisenau, in Southern Germany. But the true position of these fossils is, to say the least of it, exceedingly doubtful; and this is still more strikingly the case with the Eocene American genus *Omomys*, supposed to be an animal allied to the Hedgehogs and the Bangsrings, but which Professor Leidy himself, in describing it, compares with nearly all the types of true Insectivora and with the Opossums.

This last comparison leads us, perhaps, towards the origin of the Insectivora. In the East, the Bangsrings, and notably the beautiful little Ptilocerque, and the curious genus *Hylomys*, which, again, seems to unite the Bangsrings with the Hedgehogs through the anomalous genus *Gymnura*, present manifest relationships with the Phalangers, some of which abound in the islands further to the east. From these animals to the true Shrews, many of which abound in the east, is no great step. On the other hand, we have already seen that Brandt recognised Opossum-like characters in his *Solenodon*, but it must be confessed that these are almost exclusively external. Professor Leidy describes, besides *Omomys* above referred to, some other fossils from the Eocene of Wyoming, which he seems to regard as Insectivorous in habit, but Marsupial in structure; and the Stonesfield Mammals, although plainly Marsupial, have Insectivorous tendencies, so that the derivation of the type Insectivora from the Marsupials, or at all events the near affinity of the two orders, perhaps at several points of contact, may be looked upon as established.

In the other direction the affinities of the order would seem to be through the Shrews, Hedgehogs, and Centetidæ with the Carnivora, towards which also the curious West African *Potamogale* seems clearly to point. The Bangsrings, again, show some traces of an affinity to the Lemurs; and *Galeopithecus* seems almost to constitute a central point of alliances, uniting the Insectivora with the Lemurs and Bats, and further exhibiting, as Mr. Wallace thinks, certain peculiarities which smack

strongly of direct Marsupial relations. The relationship of the Insectivora to the Rodentia can hardly be regarded as a true affinity, although the analogies between different types in the two orders are among the most striking phenomena of the kind with which we are acquainted. The type of the Mice and Rats is reproduced by the Shrews, the Squirrels by the Bangsrings, the Porcupines by the Hedgehogs and Tanrecs, the Jerboas by the Jumping Shrews, and the Ondatra by the Desmans; whilst even the highly specialised Moles are reflected among the Rodents by the various species of Mole-Rats. But none of these resemblances indicate affinity, and the Rodent type may be regarded as differentiated from the old probably Marsupial ancestral forms quite independently of the Insectivora.

W. S. Dallas.

Printed by Cassell & Company, Limited, La Belle Sauvage, London, E.C.

THE QUEEN'S LION IN THE ZOOLOGICAL GARDENS, LONDON.

(From a Photograph by Symmons and Co., Chancery Lane, taken expressly for this work.)

CASSELL'S

NATURAL HISTORY

EDITED BY

P. MARTIN DUNCAN, M.B. (LOND.), F.R.S., F.G.S.

PROFESSOR OF GEOLOGY IN AND HONORARY FELLOW OF KING'S COLLEGE, LONDON;
CORRESPONDENT OF THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA

VOL. II.

ILLUSTRATED

CASSELL AND COMPANY, LIMITED

LONDON, PARIS & MELBOURNE

1896

ALL RIGHTS RESERVED

THE LAND CARNIVORA.

PROFESSOR W. KITCHEN PARKER, F.R.S., F.L.S., &c., AND PROFESSOR T. JEFFERY PARKER

THE AQUATIC OR MARINE CARNIVORA.

JAMES MURIE, M.D., LL.D., F.L.S., F.G.S., &c.

CETACEA.

JAMES MURIE, M.D., LL.D.

SIRENIA.

JAMES MURIE, M.D., LL.D.

PROBOSCIDEA.

PROFESSOR WILLIAM BOYD DAWKINS, M.A., F.R.S., &c., AND H. W. OAKLEY.

HYRACOIDEA.

PROFESSOR WILLIAM BOYD DAWKINS, M.A., F.R.S., AND H. W. OAKLEY.

UNGULATA:—

PERISSODACTYLA:

EQUIDÆ,
TAPIRIDÆ,
RHINOCEROTIDÆ,

ARTIODACTYLA:

SUIDÆ,
HIPPOPOTAMIDÆ.

PROFESSOR WILLIAM BOYD DAWKINS, M.A., F.R.S., H. W. OAKLEY, AND PROFESSOR A. H. GARROD, M.A., F.R.S.

CONTENTS.

THE CARNIVORA.

CHAPTER I.

INTRODUCTORY REMARKS—THE CAT FAMILY.

PAGE

The Carnivora—Division into Terrestrial (Fissipedia) and Aquatic (Pinnipedia)—Introductory Remarks on the FISSIPEDIA—Their Relations to Man and to other Animals—Their Distribution over the Surface of the Globe—Their Structure—The Diversity of their Form and Habits—Their Division into Lesser Groups—THE CAT FAMILY—Their Geographical and Chronological Distribution—Their Skeleton—The Peculiarities of their Skull, Teeth, &c. . . . 1

CHAPTER II.

THE CAT FAMILY—THE LION.

THE LION—Its Geographical Distribution at the Present Day and in Ancient Times—Its Haunts—Varieties of the Lion—Distinction between the Lion and other Cats—Its Courage, Speed, and Strength—Its Roar—Its Supposed Magnanimity—Its Habits—Man-eating—Occasional resort to Vegetable Diet——Love-making—The Lion-cubs and their Education—Old Age—Breeding in Captivity—Lion Hunting 14

CHAPTER III.

THE CAT FAMILY—THE TIGER AND THE LEOPARD.

THE TIGER—Its Colour, Size, &c.—Geographical Distribution—Mention of the Tiger by Ancient Writers—Habits of the Tiger—Its Destructiveness—Native Superstitions—Tiger-hunting—THE LEOPARD—Historical Account—External Characters—Size—Geographical Distribution—Varieties—Habits—Love of Dog-meat—Clay-eating Propensities—Attracted by Small-pox Patients 30

CHAPTER IV.

THE CAT FAMILY—THE JAGUAR—THE SMALLER WILD CATS—THE DOMESTIC CAT.

THE JAGUAR—Its Character, Distribution, and Habits—Fondness for Negroes—The PUMA—Its Character, Geographical Range, and Habits—Mode of Hunting the Puma—THE OUNCE—THE CLOUDED TIGER—The Character of its Fur, &c.—Its Habits—THE OCELOT—THE MARBLED TIGER-CAT—THE VIVERRINE CAT—THE PAMPAS CAT—THE LONG-TAILED TIGER-CAT—THE MARGAY—THE COLOCOLO—THE JAGUARONDI—THE EYRA—THE SERVAL—THE RUSTY-SPOTTED CAT—THE LEOPARD CAT—THE BAY CAT—THE SPOTTED WILD CAT—THE MANUL—THE EGYPTIAN CAT—THE COMMON WILD CAT—THE DOMESTIC CAT—Historical Sketch—Characters of Skin, &c.—Connection between Whiteness and Blindness—Habits—Use of Whiskers—Diet—Poaching Propensities—Fondness for Offspring—For Foster-children—Madness in Cats—Varieties—The Angora Cat, Manx Cat, Persian Cat, and Chinese Cat . 44

CHAPTER V.

THE CAT FAMILY—THE HYÆNA FAMILY—THE CRYPTOPROCTA FAMILY—THE AARD-WOLF FAMILY.

THE COMMON JUNGLE CAT—THE COMMON LYNX—Historical Sketch—Geographical Distribution—Distinctive Characters—Habits—Uses—THE PARDINE LYNX—THE CANADIAN LYNX—THE RED LYNX—THE CARACAL—THE CHEETAH—Distinctive Characters—Geographical Distribution—Employment in Hunting—THE HYÆNA FAMILY—External Characters—Skull and Teeth—THE SPOTTED HYÆNA—Geographical Distribution—Habits—Laughing Propensities—THE BROWN HYÆNA—THE STRIPED HYÆNA—THE CRYPTOPROCTA FAMILY—Characteristics of the CRYPTOPROCTA—Its Occurrence and Habits—THE AARD-WOLF FAMILY—Characters and Habits of the AARD-WOLF . . . 70

CHAPTER VI.

THE CIVET FAMILY. PAGE

General Characteristics of the Civet Family—Their Scent, Skull, and Teeth—THE AFRICAN CIVET—Its Characters and Habits—THE ASIATIC CIVET—THE LESSER CIVET THE GENETTE—THE MUNGOOS, OR ICHNEUMON—Curious Superstition regarding it—THE CRAB MUNGOOS—THE PARADOXURE—THE BINTURONG 87

CHAPTER VII.

THE DOG FAMILY—THE DOMESTIC DOG.

Section *Cynoidea*—Geographical Distribution—Skull of Dog—Teeth—Legs—Walk—Claws—Internal Anatomy—The Cæcum, or "Cul de sac" of the Intestine—Size—THE DOMESTIC DOG—Its Fidelity and Love—Differences between the Domesticated and Natural Species of the Family—Barking a Civilised Habit—Antiquity of the Dog—The Dog among the Hebrews and Egyptians—The Dog in the Bible—"Dog" as a Term of Reproach—Venerated by many Ancient Nations—The Dog among the Greeks and Romans—Pre-historic Dogs—Dogs in the New World—Peruvian Dogs—Superstitions about the Dog—The Dog as an article of Diet—Origin of the Dog—Identity of Structure of Wild and Domestic Dogs—The independent Training of Wild *Canidæ* by Savages in many parts of the World—Voice—Results of the whole question as to Origin—Anecdotes about Instinct, Reason, Docility—Muscles of Dog's Head—Consociation of Dogs—Anecdotes of Sense of Right, Wrong, Duty, Conscience—Sensitiveness, Honesty, Theft, Cunning, Quarrelsomeness, Magnanimity, the reverse, Revenge, Hatred—Conjugal Affection—Devotion to Man—Fickleness—Despair—Rabies and Hydrophobia—Wonderful Variety of Breed . . 96

CHAPTER VIII.

THE DOG FAMILY—DOGS OF SAVAGES—DOGS OF CIVILISED NATIONS—WILD DOGS.

THE HARE INDIAN DOG—Its Characters, Disposition, &c.—THE ESKIMO DOG—The Dependence of the Greenlanders on its Existence—The Probability of its Speedy Extinction—Its Characters and Savage Disposition—Its Uses—DOMESTIC DOGS OF OTHER SAVAGE TRIBES—African Breeds—South American Breeds—THE DALMATIAN DOG—THE GREYHOUND—THE SCOTCH GREYHOUND—THE DEERHOUND—THE TURKISH GREYHOUND—THE GRECIAN GREYHOUND—THE PERSIAN GREYHOUND—THE ITALIAN GREYHOUND—THE COCKER—THE SPRINGER—THE KING CHARLES'S SPANIEL—THE BLENHEIM SPANIEL—THE CHINESE PUG-DOG—THE WATER-SPANIEL—THE POODLE—THE MALTESE DOG—THE LION-DOG—THE TURKISH DOG—THE ST. BERNARD DOG—THE NEWFOUNDLAND DOG—THE SHEEP-DOG—THE POMERANIAN DOG—THE CUR—THE LURCHER—THE BEAGLE—THE HARRIER—THE FOXHOUND—THE STAGHOUND—THE BLOODHOUND—THE SETTER—THE POINTER—THE RETRIEVER—THE OTTER-HOUND—THE TURNSPIT—THE DACHSHOUND—THE BULL-DOG—THE BULL-TERRIER—THE MASTIFF—THE CUBAN MASTIFF—THE TIBET DOG—THE ENGLISH TERRIER—THE SCOTCH TERRIER—PARIAH DOGS—THE INDIAN WILD DOG—THE DINGO 127

CHAPTER IX.

THE DOG FAMILY—WOLVES—JACKALS—FOXES, ETC.

THE WOLF—Historical Account—Geographical Distribution—Characteristics—Habits—Destructiveness—Tame Wolves—Varieties of the Wolf—THE PRAIRIE WOLF—THE RED WOLF—THE JACKAL—Its Character—Habits—"Jackal's Horn"—Occurrence—THE BLACK-BACKED JACKAL—THE SENEGAL JACKAL—THE AGUARA—THE COMMON FOX—Characters distinguishing it from the true Dogs—Its Habits—Cunning—Occurrence—THE ARCTIC FOX—Its supposed Change of Colour according to Season—Its Habits—The Value of its Skin—THE FENNEC—THE LONG-EARED FOX—Why made a Distinct Genus—THE RACOON DOG—THE HYENA DOG—Its Character and Habits . . . 149

CHAPTER X.

THE BEAR FAMILY—THE BEARS.

Characters of the URSIDÆ—Their Mode of Progression—Teeth—Skull—Geographical Distribution—THE BROWN BEAR—Its Occurrence—Character—Habit of Hibernating—Diet—Moral Characteristics—Bear-baiting—Varieties—THE AMERICAN BLACK BEAR—Its Habits—Superstitions of the Indians regarding it—THE GRIZZLY BEAR—THE SYRIAN BEAR—THE HIMALAYAN BEAR—THE SUN BEAR—THE SLOTH BEAR—Its Ant- and Bee-eating Propensities—THE SPECTACLED BEAR—THE POLAR BEAR—Its Size—Characteristics—Habits—Method of Hunting—The supposed Poisonous Properties of its Liver 163

CHAPTER XI.

THE RACOON FAMILY—THE PANDA FAMILY—THE WEASEL FAMILY—FOSSIL CARNIVORA.

THE RACOON FAMILY—Characters of their Skull, Teeth, &c.—Geographical Distribution—THE RACOON—Its Habit of Washing its Food—Its External Characters and Habits—Racoon Hunting—The Crab-eating Racoon—THE COATI

PAGE

—The Kinkajou—Its Lemur like Appearance, Prehensile Tail, &c.—The Cacomixle—The Panda Family—The Panda—Its Character and Habits—The Ailuropus The Weasel Family—Anatomical Characters—Tail-glands—Division of the Family into Three Sub-families—Importance of the Mustelidæ as Fur-producing Animals—The Glutton—Its Characters—Superstitions Regarding it—Its Cunning—The Marten—The Pekan—The Sable—The Weasel—The Stoat, or Ermine—The Difference between its Winter and Summer Dress, and the manner in which the Change takes place—The Polecat—The Ferret—The Mink—The Grison—The Tayra The Ratel—The Common Badger—Its Habits—Burrowing—The American Badger—The Teledu—The Cape Zorilla—The Common Skunk—Its Noxious Secretion—Hydrophobia produced by Skunk Bite—The Little Striped Skunk—The White-backed Skunk—The Common Otter—The Adaptation of its Structure to Aquatic Life—Use of Tame Otters for Fishing—The Canadian Otter—The Margined-tailed Otter—The Sea Otter Its Affinities with the Seals—How it is Hunted—General Relations of the Land Carnivora—Fossil Carnivora—The Tendency of these to bridge over Existing Groups—Appendix to Chapter VI. (Civet Family)—The Cynogale—The Cynictis—The Mangue—The Suricate 177

THE AQUATIC OR MARINE CARNIVORA.

CHAPTER I.

INTRODUCTION—THE WALRUS, OR MORSE.

Pinnipedia distinctly Aquatic—The Three Families—Their Common Characteristics—Skeleton—Mobility of Figure—Feet—Dentition—Skull—Tongue—Stomach—Intestine—Peculiar Disposition of Blood-vessels of Liver—Lungs—Sense of Smell—Larynx—Brain—Sense of Hearing—The Walrus Family—Characteristics—The Walrus, or Morse—Geographical Distribution—Fossil Forms—Weight—Size—Appearance in Old Age—Mode of Walk—Habits—On Guard—In the Water—Attacked—Tusks—Dentition of the Young—Uses of the Tusks—Food—Long Fasts—Story of "Jamie," a Tame Walrus—The Young—Maternal Affection—Massacre—Walrus as an Article of Diet . . . 209

CHAPTER II.

II.—THE SEA LION FAMILY (OTARIIDÆ).

Various Names—Peculiarities of Distribution—Characteristics of the Family—Dentition—Skull—Fossil Remains—Distinction between Fur and Hair Seals—Preparation of the Seal-skin—The Northern Fur Seal—History—The Pribyloff Islands—Male, Female, Young—"Hauling-grounds"—Wintering—Males at the Islands in Spring—Desperate Battles for Seaward Positions—Approach of the Females—Struggles for Wives—The Young—Abstinence from Food, Water, and Sleep for more than Two Months—Neutral Ground in the "Rookeries"—Habits of the Young—Food—Annual Slaughter—Estimated Numbers—Mode of Killing—Steller's Sea Lion—Gillespie's Hair Seal—Hooker's Sea Bear—The Wreck of the *Grafton*—Musgrave's Narrative—Sufferings of the Castaways—Their Experiences among the Sea Bears—The White-necked Otary—Distribution—Description—"Counsellor Seal"—The Patagonian Sea Lion—Historical Associations—Impetus to the Study of the Family—François Lecomte—Its Docility and Intelligence—Its various Performances—Voracity—Lecomte's Observations—Habits—The Falkland Island Fur Seal—Habitat—The Hunter's Boats—Driven from their Haunts—Captain Weddell's Observations—Great Wariness and Speed—Size—Habits—The South African, or Cape Fur Seal—The New Zealand Fur Seal—The Ash-coloured Otary—Peron's Services to Science 216

CHAPTER III.

III.—THE EARLESS SEAL FAMILY (PHOCIDÆ).

General Characteristics—Peculiar Formation of the Hind Legs—Dentition—Swimming—The Common Seal—Range—Fight between a Seal and Salmon—Colour—Appearance—Annual Catch—Use of Skins in Greenland—Habits—The Ringed Seal—Appearance—Various Names—Odour—Flesh—Skin Clothes—Haunts—Modes of Capture—Range—The Greenland, or Saddleback Seal—Habits—Appearance—Names—Range—Migrations—"Seals' Weddings"—Five Stages of Colour—Females—Weight—Seal Fisheries—Hunting—Implements of Slaughter—Various Operations—The Sealers—Oil, Skins, &c.—The Bearded Seal—The Grey Seal—The Monk Seal—The Crested or Bladder-Nose Seal—Range—Size—Ferocity—Character of the so-called Crest—Dentition—Colour—The Elephant Seal—Peculiar Range—Proboscis—Scammon's Account—Habits—Hunting—Hardships of the Hunters—Recreations of the Men—Blubber, Oil, and Skins—Ross's Large-eyed Seal—The Sea Leopard—Weddell's Seal—The Crab-eating Seal—Concluding Remarks—The Slaughter of Seals—Remedies 231

ORDER CETACEA.—WHALES.

Whales—Vulgar Notions—Characteristics External and Internal—Larynx—Tail—Skeleton—Classification—THE TOOTHED WHALES—Zeuglodons—Squalodons—Phocodons—River Dolphins—Susu, or Gangetic Dolphin—Description—Habits—Teeth—Inia—Pontoporia—Ziphioid Whales—Cuvier's Whale—Van Beneden's

PAGE

WHALE—SOWERBY'S WHALE—NEW ZEALAND BERARDIUS—BOTTLEHEAD, OR COMMON BEAKED WHALE—SPERM WHALES, OR CACHALOTS—SPERM WHALE—Description—Range—Fishery—Incidents of the Chase—Habits—Harpooned—Treatment of the Carcass—SHORT-HEADED WHALE, OR SNUB-NOSED CACHALOT—DOLPHINS—CAAING, OR PILOT WHALE—RISSO'S GRAMPUS—COMMON PORPOISE—KILLER WHALE, OR ORCA—Ferocity—TRUE DOLPHINS—COMMON DOLPHIN—BOTTLE-NOSE DOLPHIN—WHITE WHALE—NARWHAL—THE WHALEBONE WHALES—Whalebone—GREENLAND, OR RIGHT WHALE—BISCAY WHALE—JAPAN WHALE—CAPE WHALE—SOUTH PACIFIC WHALE—Description of the Greenland Whale—Their Food and Mode of Feeding—Habits—Hunting—Treatment of Carcass—HUMP-BACKED WHALES—FIN WHALES, OR RORQUALS—SIBBALD'S RORQUAL—SULPHUR-BOTTOM WHALE—COMMON RORQUAL, OR RAZOR-BACK—LESSER RORQUAL—Concluding Remarks 245

ORDER SIRENIA (THE MANATEES).

Introductory Remarks—Mermaids—Position—General Characteristics of the Order—STELLER'S RHYTINA—Habits—Extinct—Dugong—Range—Habits—Uses—Teeth—MANATEE—Distribution—Peculiar Mouth—Mode of Feeding—Story of "Patcheley," a Tame Manatee—Halitherium and other Fossil Forms 268

ORDER PROBOSCIDEA (ELEPHANTS).

Order Proboscidea—Antiquity of the Elephant—Referred to in the Bible—Mentioned in the Apocrypha—War Elephants—Their Accoutrements—Hannibal's Elephants—Elephants amongst the Romans—Skull—Dentition—Vertebræ—Old Delusion about its Legs—Proboscis—Species—THE INDIAN ELEPHANT—Size—Range—Habits—Various Modes of Capture—Keddah—Used as a Labourer or Nurse—Sagacity—White Elephants—THE AFRICAN ELEPHANT—Characteristics—Range—Habits and Haunts—Hunting—Pitfalls—Aggageers Chasing—Elephant-Shooting—How the Natives Cut it up—FOSSIL ELEPHANTS AND THEIR ALLIES—Absurd Stories—MAMMOTH—How it was first Found—Story of the Fourth or Benkendorf's Discovery—Range—MASTODON—DINOTHERIUM 273

ORDER HYRACOIDEA (CONIES).

What is the Coney?—Mention in the Bible—General Appearance—Real Place—Range—Varieties—Coney of the Bible—Cape Coney—Ashkoko of Abyssinia—Mr. Winwood Reade's Account of the Habits of the Cape Coney—Skull, Dentition, Ribs, &c. 292

ORDER UNGULATA (HOOFED QUADRUPEDS).

CHAPTER I.

PERISSODACTYLA—THE EQUIDÆ, OR HORSE FAMILY.

Order *UNGULATA*—Divisions—PERISSODACTYLA—Characteristics—EQUIDÆ—Species—Descent—First Domestic Horses in Europe—Used for Food—Mention of the Horse in the Bible—War-Chariots—the Horse among the Greeks and Romans—in Britain—Attempts to Improve the Breed—Colour—Teeth—"The Mark"—the Foot—Skull—Disease from the Gad-fly—RACE-HORSE—TROTTING HORSE OF AMERICA—DRAY HORSE—SHETLAND PONY—ARAB AND BARB—PERSIAN HORSE—WILD HORSES IN AMERICA—Habits—Byron's "Mazeppa"—Capture and Breaking in—WILD HORSES IN AUSTRALIA—THE ASS—Species—Stripes—Characteristics—MULE AND HINNY—WILD ASS OF TIBET—ONAGER—WILD ASS OF ABYSSINIA—ZEBRAS—BURCHELL'S ZEBRA—QUAGGA—FOSSIL EQUIDÆ—Distribution—HIPPARION 295

CHAPTER II.

PERISSODACTYLA—THE TAPIR AND RHINOCEROS FAMILIES.

Introductory Remarks on the Tapirs—Foot—Anatomical Features—Skull—Compared with that of Hog—Skull of Asiatic Tapir—Proboscis—Dentition—Species of Tapir—THE AMERICAN TAPIR—Habits—Colour—Modes of Hunting—Docility—THE HAIRY TAPIR—THE MALAYAN TAPIR—FOSSIL TAPIRS—THE RHINOCEROSES—General Characteristics—Is it the Reëm of the Bible?—Ludicrous Ideas respecting it—At Rome—First Rhinoceroses in Europe—Skeleton—Skull—Horns—Curious Dental Law—Fore and Hind Limbs—Dentition—AFRICAN RHINOCEROSES—"WHITE" RHINOCEROS—OSWELL'S RHINOCEROS—BLACK RHINOCEROS—KEITLOA—RHINOCEROS BICORNIS MINOR—Hunting—Sir Samuel Baker's Extraordinary Chase—Gordon Cumming's Account of the Characteristics and Habits of the Black and White South African Rhinoceroses—Rhinoceros Birds—THE ASIATIC RHINOCEROSES—Connection between Dentition and Horns—THE INDIAN RHINOCEROS—An Inveterate Enemy of the Elephant—THE JAVAN RHINOCEROS—THE SUMATRAN RHINOCEROS—THE HAIRY-EARED RHINOCEROS—How a Specimen, "Begum," was Captured—THE FOSSIL RHINOCEROSES—The Extinct Families Palæotheridæ and Macraucheniadæ 317

CHAPTER III.

ARTIODACTYLA—THE PIG OR HOG FAMILY.

PAGE

Introductory Remarks on the Artiodactyla—Character of their Feet—The Wanting Digit—Comparison of the Bones of the Fore Feet of Representative Animals—Other Characters in the Artiodactyla—Classification—SUIDÆ, OR HOG FAMILY—Groups of the Family—Snout—Sense of Smell—Libels—Mention in the Bible—Among the Jews—Range—Teeth—THE WILD BOAR—General Features—Habits—Historical Mention—THE INDIAN HOG—Habits—A Wild Boar Hunt—A Noble Foe—THE DOMESTIC HOG—The "Irish Greyhound Pig"—Effects of Domestication—THE SOLID-HOOFED BREED OF PIGS—Description of the Bones of Foot—MASKED PIG—BUSH HOG—BABIRUSA—THE WART HOGS—ÆLIAN'S WART HOG—THE ETHIOPIAN WART HOG—PECCARIES—Habits—Dentition—Feet—Species—THE FOSSIL HOGS 335

CHAPTER IV.

ARTIODACTYLA—THE HIPPOPOTAMUS FAMILY.

Present Representatives—Two Species—THE COMMON RIVER HORSE—General Appearance—Characteristics: Skin, Head, Nostrils, Eyes, Ears, Legs, Tail, Mouth, Tusks, Dentition, Skeleton, Stomach—Habits—Food—Under Water—Behemoth of the Bible—Used in the Roman Sports—As described by the Ancient Naturalists—As portrayed by the Ancient Artists—The First Hippopotamus in England—Subsequent Inmates of the Zoological Gardens—Herds of Hippopotami—Harpoon for Hunting—Sir Samuel Baker's Accounts of Hippopotamus Hunts—Various Methods of Capture—Occasional Fits of Blind Fury—A Night Attack upon a Diahbeeah—Uses of the Hippopotamus—THE LIBERIAN HIPPOPOTAMUS—Fossil Forms—THE ANOPLOTHERES 348

LIST OF ILLUSTRATIONS.

PAGE

The Queen's Lion . . . . *Frontispiece.*
Lion of Guzerat 1
Upper View of Lion's Skull 4
Skeleton of Lion—Skeleton of Polar Bear . . 5
Stomach of Lion—Brain of Dog—Longitudinal Section through a Dog's Nose, showing the Spongy Bones 7
Side View of Lion's Skull—Under View of Lion's Skull 11
Tendons and Ligaments of a Cat's Toe—Lion's Claw, Sheathed and Unsheathed . . . 12
Permanent Teeth of Lion—Milk Teeth of Lion . 13
Lion of Senegal 16
Lion of Barbary 17
Lion and Lioness Attacking an Elephant . . 20
The Kiss of Peace 26
In the Jungle 32
The Tiger . . . . . *To face page* 33
The Dying Man-eater 33
A Tiger Hunt 37
The Leopard 41
The Jaguar 45
The Snow Leopard 48
The Ounce 49
The Clouded Tiger 50
The Ocelot 51
The Marbled Tiger-Cat 52
Skull of Viverrine Cat 53
The Long-tailed Tiger-Cat 54
The Margay 55
The Jaguarondi 56
The Eyra 57
The Bay Cat 58
The Egyptian Cat 60
The Common Wild Cat 61
Teeth of Domestic Cat—Mummy of Egyptian Cat—Skeleton of Domestic Cat 62
The Domestic Cat 64
Angora Kittens 65
Domestic Cats: a Study 69
The Common Lynx 72
The Canadian Lynx 73
The Caracal 74
Skull of Cheetah 76
The Cheetah 77
Skull of Hyæna—Teeth of Hyæna—Lower Jaw of Hyæna 79
Skeleton of Hyæna 80
Teeth of Spotted Hyæna 81
Hyænas in an Arabian Cemetery 83
Striped Hyænas and Jackals . . *To face page* 83
The Aard-Wolf 85

PAGE

Skull of Aard-Wolf 86
Skeleton of Civet 87
Teeth of Civet 88
The African Civet 89
The Lesser Civet 90
Ichneumons 92
The Common Paradoxure 94
The Binturong 95
Side View of Wolf's Skull 96
Upper View of Wolf's Skull—Under View of Wolf's Skull—Teeth of Wolf 97
Skeleton of Wolf 98
Greyhounds (*From an Egyptian Monument*) . . 100
Skull of Domestic Dog—Skull of Young Dog . 103
Hare Indian Dog 104
Eskimo Dogs 105
The Mastiff 109
The Black Retriever 113
Muscles of Dog's Head 114
The Italian Greyhound 116
The Greyhound 117
The Colley, or Sheep Dog 120
Newfoundland Dogs 121
The Pomeranian Dog 125
King Charles's Spaniels 133
Poodles 134
St. Bernard Dogs . . . . . *To face page* 135
Foxhounds 136
Head of Bloodhound 137
Pointers 140
Dachshounds, or Badger-Dogs 142
The Bull Dog . . . . . *To face page* 143
The Tibet Dog 144
The Dingo 147
The Common Wolf 152
Young Wolves . . . . . *To face page* 153
Coyote, or Prairie Wolf 155
The Jackal 156
The Jackal of Senegal 157
The Common Fox 158
Fennecs and Jerboas 161
The Hyæna Dog 163
Teeth of Polar Bear 164
Feet of Bear—Under View of Bear's Skull . . 165
The Common Brown Bear 166
The Grizzly Bear 168
The Isabelline, or Indian White Bear . . . 169
The Malayan Sun Bear 170
Polar Bears 171
The Sloth Bear 173
Polar Bears 175
Skull of Racoon—Half of Skull of Racoon . . 177

PAGE

The Racoon 178
The Coati—Skull of Kinkajou 179
Skull of Cacomixle—The Cacomixle . . . 180
The Panda 181
Skeleton of Weasel 182
The Glutton 183
The Sable 186
The Common Weasel 187
The Weasel and the Ermine in their Winter Clothing 189
Skull of Polecat—The Polecat—The Ferret . . 190
The Grison 192
The Ratel 193
The Badger . . . . . *To face page* 195
The Skunk 197
Under View of Skull of Common Otter—Side View of Skull of Common Otter 198
Common Otters 200
Side View of Skull of Sea Otter—Under View of Skull of Sea Otter 201
Female Sea Otter Swimming on her Back with Young in her Arms 202
The Sea Otter. 203
Skull of Machærodus 204
Skull of Arctocyon—Lower Jaw of Hyænodon . 205
Skull of Proviverra—The Cynogale . . . 206
The Mangue 207
The Suricate 208
Skeleton of Otaria in the Attitude of Walking . 210
Upper Surface of Brain of Otaria—Tongue and Parts Back of Mouth of Otaria . . . 211
Head of Walrus—Skull and Dentition of Walrus . 212
Walruses on the Ice 215
Sea Lion . . . . . *To face page* 217
Ear of Otaria—Teeth of Otaria 217
Diagram of a Vertical Section of the Skin of the Fur Seal 218
"Rookery" of Fur Seals 220
A Seal Fight 221
Sea Lions on the Farallone Islands 223
Palate of Hooker's Sea Bear—Palate of Patagonian Sea Lion 224
Sea Lion Dozing on his Back—Sea Lion Fast Asleep—Sea Lion Climbing—Sea Lion in Watchful Attitude—Sea Lion Licking his Leg—Sea Lion Scratching with Hind Foot . . 227
The Falkland Island Fur Seal 229
Left Fore and Hind Flipper of New Zealand Fur Seal 230
Hind Flippers of Ringed Seal 231
Teeth of Common Seal—Skeleton of Seal . . 232
The Ringed Seal 234
Eskimo Hunters at an Atluk, waiting for a Seal . 235
Saddle-backs on the Ice 236
The Crested Seal 239
Teeth of the Crested Seal 240
The Elephant Seal 241
Sea Leopard Seals 242
Teeth of the Sea Leopard 243
Stomach of Pilot Whale—Upper Surface of the Brain of the Porpoise 245
Interior View of Larynx of Risso's Grampus—Skeleton of Sperm Whale 246
Restoration of Skull and Tooth of Zeuglodon . . 247

PAGE

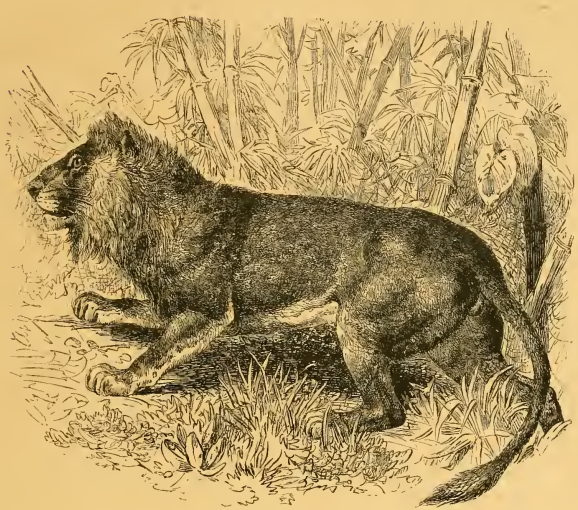
Side and Upper Views of Skull; Rearward and Forward Tooth of Young of Gangetic Dolphin 248
The Gangetic Dolphin—Flipper of Gangetic Dolphin 249
Head of Mesoplodon 251
A Tooth of the Sperm Whale 252
The Sperm Whale 253
The Caaing, or Pilot Whale 255
Risso's Grampus 256
Shoal of Porpoises 257
The Killer Whale, or Orca—The Bottle-Nose Dolphin 258
Dolphins Pursuing a Boat 259
The Narwhal 260
Narwhal with the two Tusks Developed . . . 261
Median Section showing Inside Left Half of Skull of Whalebone Whale, with Baleen in Position 262
The Greenland or Right Whale . . *To face page* 263
Views to illustrate Position and Structure of Baleen 263
Harpoon 265
Hump-back Whale Suckling her Young . . . 266
Common Rorqual 267
Skeleton of Manatee 268
Manatees 271
Mounted Skeleton of Halitherium 272
Skeleton of Indian Elephant 273
Section of Skull of Indian Elephant . . . 275
Side View of Molar Tooth of Indian Elephant—Last Lower Tooth of African Elephant—Last Lower Tooth of Indian Elephant . . . 276
Trunk or Proboscis of Elephant 277
The Indian Elephant 279
Elephant in the Zoological Gardens, London . 281
The African Elephant 283
Aggageers Hunting an Elephant 285
Skeleton of Mammoth 288
The Mammoth (*Restored*) 291
Conies 293
Skull of Coney—Dentition of Coney . . . 294
The Kiang, or Wild Ass of Tibet 295
The Tarpan 296
Wild Horse of Tartary 297
Dentition of Horse—Vertical Section of Incisor of Horse 300
Incisors and Canines of Horse and Mare—Bones of Fore and Hind Limbs of Horse . . . 301
Skeleton of Horse 302
Brain of Horse 303
The English Race-Horse 304
Shetland Ponies 305
English Dray Horse, from the Stud of Messrs. Barclay, Perkins, & Co. . . *To face page* 307
The Arab Horse 307
The Domestic Ass 310
The Onager 311
The Wild Ass of Abyssinia 312
Zebra 313
Burchell's Zebra 314
The Quagga 315
Fore and Hind Foot of Tapir—Skull of American Tapir 317
Head of Malayan Tapir, showing Muscles of Short Trunk and Face—Teeth of Malayan Tapir . 318

PAGE

American Tapirs 319
The Malayan Tapir 320
Skeleton of the Rhinoceros 323
Femur of Rhinoceros—Dentition of Rhinoceros . 324
The "White" Rhinoceros 325
The Keitloa 326
The Rhinoceros Hunt 328
Rhinoceros . . . . . *To face page* 329
Front and Side Views of Head of Sumatran Rhinoceros 330
The Indian Rhinoceros 331
The Hairy-eared Rhinoceros 333
Skull of Fossil Rhinoceros 334
Bones of the Left Fore Limb of Common Pig, African Deerlet, Javan Deerlet, Roebuck, Common Sheep, and Camel 335
Dentition of Wild Boar 338
The Wild Boar 339

PAGE

Domestic Sow and Young 341
Head of Domestic Pig—Head of Wild Boar—Milk Dentition of Pig—Irish Greyhound Pig 342
Bones of Pig's Foot—Foot of Solid-hoofed Pig . 343
The Masked Pig—The Bush Hog 344
The Babirusa 345
Skull of the Ethiopian Wart Hog—The Ethiopian Wart Hog 346
The Peccary—Dentition of Peccary . . . 347
Hippopotami in a Meadow by the Senegal . . 348
Base of Skull of Hippopotamus—Lower Jaw of Hippopotamus—Stomach of Hippopotamus . 349
The Common Hippopotamus 352
The Hippopotamus . . . . . *To face page* 353
Hunting Hippopotami with the Harpoon . . 353
Hippopotami at the Falls of the River Senegal . 356
The Anoplothere Restored 360



LION OF GUZERAT.

THE CARNIVORA.

CHAPTER I.

INTRODUCTORY REMARKS—THE CAT FAMILY.

The Carnivora—Division into Terrestrial (Fissipedia) and Aquatic (Pinnipedia)—Introductory Remarks on the FISSIPEDIA—Their Relations to Man and to other Animals—Their Distribution over the Surface of the Globe—Their Structure—The Diversity of their Form and Habits—Their Division into Lesser Groups—THE CAT FAMILY—Their Geographical and Chronological Distribution—Their Skeleton—The Peculiarities of their Skull, Teeth, &c.

THE Carnivora, or flesh-eating Mammals, form a fourth order of the Mammalia, and are divided into two great groups, or sub-orders as they are called by zoologists, one terrestrial, and the other aquatic. The first is the group of the *Fissipedia*, or "split-feet," so called from the fact that the feet are divided into well-marked toes; the second is the group of the *Pinnipedia*, or "fin-feet" (Seals, &c.), so called from the fact that the toes are bound together by skin, forming fins or flippers rather than feet.

THE LAND CARNIVORA.*

This group, which comprises all the great "beasts of prey," is one of the most compact, as well as one of the most interesting among the Mammalia. So many of the animals contained in it have

* *Fissipedia.*

become "familiar in our months as household words," bearing as they do an important part in fable, in travel, and even in history: so many of them are of such wonderful beauty, so many of such terrible ferocity, that no one can fail to be interested in them, even apart from the fact likely to influence us more in their favour than any other—that the two home pets which of all others are the commonest and the most interesting belong to the group.

No one who has had a Dog friend, no one who has watched the wonderful instance of maternal love afforded by a Cat with her kittens, no one who loves riding across country after a Fox, no lady with a taste for handsome furs, no boy who has read of Lion and Tiger hunts, and has longed to emulate the doughty deeds of the hunter, can fail to be interested in an assemblage which furnishes animals at once so useful, so beautiful, and so destructive.

It must not be supposed from the name of this group that all its members are exclusively flesh-eaters—and, indeed, it will be hardly necessary to warn the reader against falling into this mistake, as there are few people who have never given a Dog a biscuit, or a Bear a bun. Still, both the Dog and several kinds of Bears prefer flesh-meat when they can get it; but there are some Bears which live almost exclusively on fruit, and are therefore in strictness not carnivorous at all. The name must, however, be taken as a sort of general title for a certain set of animals which have certain characters in common, and which differ from all other animals in particular ways.

Comparatively few of the flesh-eaters are of direct use to man, at any rate while alive, yet one member of the group—the Dog—is the most useful of all domestic quadrupeds, though derived from one of the most savage of all—the Wolf. The Ferret, the Cheetah and the Cat are also more or less domesticated; but they come far below the Dog in amiable qualities, and in value to man. Below their value in service comes the use of their most beautiful skins; and still lower down the scent, derivable from a few species. Yet from these two last sources our fair ones seek to derive new charms, not heeding the poet Cowley's quaint objurgation:—

> "The adorning thee with so much art
> Is but a dangerous skill;
> Like to the poisoning of a dart,
> Too apt, before, to kill."

Most of the Carnivora may be looked upon as man's natural enemies, for he has no chance of making headway unless he can keep "the beast of the field" from "increasing upon him." Amongst primæval men, the tribes who made the best weapons to keep off these, the destroyers of their families, were certain to succeed best in the struggle for existence, so that the act of sharpening a flint-stone to repel the attack of some wild beast may be said to have prepared the way for civilisation, for flint knives led to bronze hatchets, bronze hatchets to axes and hammers of iron, and when once iron-working was understood and appreciated, civilisation went on with gigantic strides.

Besides acting as one of the severest of schoolmasters in the hard school of adversity in which man has been trained, the flesh-eaters serve to keep in check, and indirectly to bring to perfection, the grass-eating tribes. Upon these—the Oxen, Antelopes, Wild Asses, &c.—the large Carnivora delight to prey; in so doing they have to put forth all their powers, their agility, strength, and cunning, while the Herbivores, at the same time, have acquired caution and swiftness of foot in the highest degree, in order to escape from their ruthless and implacable destroyers.

While the larger beasts of prey keep in check the troops of great hoofed animals, the smaller kinds, such as Cats and Ferrets, have a most important office in thinning the constantly multiplying ranks of gnawing animals, such as Rats and Mice, which would otherwise prove a plague of the worst description. Indirectly, too, our Carnivora may even influence largely the spread of certain kinds of vegetation: for instance, as Mr. Darwin has shown, where there are no Cats there is no clover! This seems strange, not to say fabulous, but it is known that clover will only flourish when there are plenty of Humble-bees, the only insects able to carry the fertilising pollen from flower to flower, and so ensure a good supply of seed for the next crop. Now, Field Mice are particularly hostile to Humble-bees, knowing quite well where to find their nests and combs, and how to get at their honey, of which they are very fond. Thus, where Field Mice exist in great numbers, Humble-bees will be comparatively few. But Mice are chiefly kept down by Cats, and

so the end of this biological "house that Jack built" is that to ensure a good crop of clover it is advisable to have plenty of Cats about!

The conception of the fearful struggle for existence going on between beast and beast has been caught by Shakspere in a wonderful passage in his "Timon of Athens." Apemantus would "give the world to the beasts to be rid of the men," whereupon Timon asks him whether he would have himself "fall in the confusion of men, and remain a beast with the beasts." Apemantus answers in the affirmative, and Timon's rejoinder is as follows: "A beastly ambition, which the gods grant thee to attain to! If thou wert the Lion, the Fox would beguile thee: if thou wert the Lamb, the Fox would eat thee: if thou wert the Fox, the Lion would suspect thee, when, peradventure, thou wert accused by the Ass: if thou wert the Ass, thy dulness would torment thee, and still thou livedst but as a breakfast to the Wolf: if thou wert the Wolf, thy greediness would afflict thee, and oft thou shouldst hazard thy life for thy dinner: wert thou the Unicorn, pride and wrath would confound thee, and make thine own self the conquest of thy fury: wert thou a Bear, thou wouldst be killed by the Horse: wert thou a Horse, thou wouldst be seized by the Leopard: wert thou a Leopard, thou wert german to the Lion, and the spots of thy kindred were jurors on thy life: all thy safety were remotion, and thy defence, absence." To learn the truth of these words, one has only to turn to any book of travel in Africa or India, where one is certain to read of a wholesale destruction which it is melancholy to think of.

In Great Britain this conflict is a thing of the past; but two terrible enemies of man even there have been extirpated within the historic period—namely, the Wolf and the Bear; of these and of their extirpation we shall speak when we come to describe those types. Now, happily, these greedy Carnivora are "scattered and peeled—meted out and trodden down." Far in the north of the island there is the wild Cat, the two Martens are becoming scarcer and scarcer; the Badger is found here and there; the Polecat is rare; so that the Fox, the Stoat, and the Weasel—the last being the very least and meanest of the order—alone are common.

But in the later geological epoch—pre-historic as to us—the nobler types abounded, and Great Britain was then as much the land of savage beasts as Africa and India are now.

The Carnivora are found all over the world, from the equator to the poles: in most parts of the globe they are abundant, the great exception being the Australian region of zoological geography, namely, the immense island of Australia, which can only boast of a Dog, doubtfully native, and New Zealand and the adjacent Polynesian Islands, which are quite devoid of members of the group, the native Dog of New Zealand having probably been recently introduced.

Many forms have become extinct, and, as we shall see when we come to speak of these bygone creatures, the lower we dig in the strata which compose the rocks of which our earth is made, the lower do the types become, that is to say, among the extinct Carnivora we have no animals so perfectly constructed for flesh-eating as the Cat family, for instance, but the various kinds get nearer and nearer, the lower we go, to what may be called the general plan of Mammalian structure, and farther and farther from the special type of structure found in the higher Carnivores of the present day.

There is considerable range of size among the various members of the group, the Lion and Tiger being the largest, the Weasel and Suricate the smallest. As to their habits, the Carnivora are very varied; leaving out as we do for the present the fin-footed Seals, Sea Bears, and Walruses, we yet have the semi-aquatic Otter and the *Enhydra*, or Sea Otter, both at home in the watery element, and most expert swimmers and divers; but for the most part the flesh-eaters are inhabitants of the copse, the jungle, and the forest. Many are nimble climbers, some are arboreal in their habits, living entirely in trees, and most are crepuscular, that is, hunt their prey after dusk.

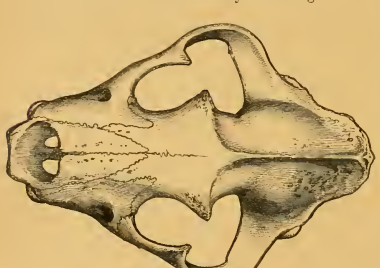
As to their diet, we mentioned above that they are by no means all flesh-eaters; in fact there is every gradation from those which live exclusively on animal food, such as the Lion, Tiger, &c., to the purely herbivorous kinds of Bear. Some again, such as the Cat family, seem to prefer flesh-meat, others, such as the Otter, adopt a Lenten diet, and feed on fish or eggs. This matter, however, is, of course, largely determined by the habitat of the animal, those whose habitation is inland being compelled to devour land animals, while those living by the sea or by river-banks usually take to fish either occasionally or as a regular thing.

Turning to the structure of the group, one of the first things that strikes us is the looseness of their skin, which, instead of being stretched on the body as tightly as a drum parchment, as it is in

grass-eaters—for instance, the Ox or Hippopotamus—is quite "baggy," having between it and the flesh of the beast a layer of the loosest possible fibres. It is for this reason that the skin of any but a *very* fat Dog can be pinched up so readily, while of a Herbivore it may be said, in the words of eulogy uttered by Mr. Squeers of his son Wackford, "Here's firmness, here's solidness! why you can hardly get up enough of him between your fingers and thumb to pinch him anywheres." In consequence of this the operation of skinning a Lion or Bear is a comparatively easy one. After the first cut the beast may be *pulled* out of his skin, almost without further use of the knife; while with an Antelope or an Ox the skin has to be *cut* away carefully and laboriously from the underlying flesh.

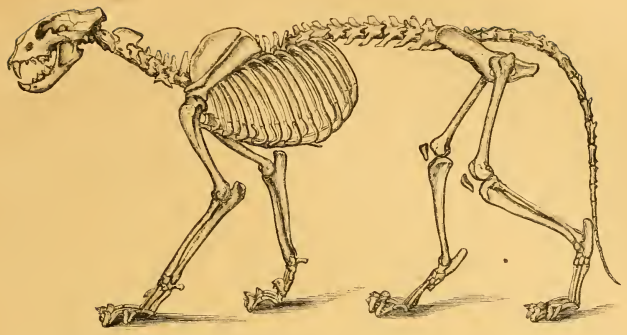
The use of this loose skin will be very evident to any one who will take the trouble to watch the great Cats playing together at the Zoological Gardens. They are continually scratching one another, but the loose skin is dragged round by the claws which, in consequence, can get no hold, and do no harm; with a tight skin, on the other hand, the slightest scratch of such a claw as a Tiger's would cause a serious wound. The looseness of the skin is very evident in the Puma and Jaguar, in which it hangs in a fold along the middle of the belly, like a great dewlap.

In the Carnivora the skeleton, or bony framework of the body, attains its utmost perfection, both as a *tissue* and as machinery. Its tissue is dense, white, and ivory-like, every bone is exquisitely moulded and polished, so that there are few more beautiful objects of study than a well-prepared Cat's skeleton, and almost none more instructive or better calculated to give an idea of the perfection of "animal mechanics." The flexibility and strength of the spine, the exquisite fitting of its joints, the small head capable of being turned in almost any direction in the search for prey or the avoidance of danger, the wonderful arrangement of levers afforded by the limbs, which exhibit at once the greatest amount of strength and the greatest amount of elasticity, all combine to fill the mind with wonder and admiration, as great as that excited by the most perfect work of art or the most stupendous phenomenon of inanimate nature.



UPPER VIEW OF LION'S SKULL.

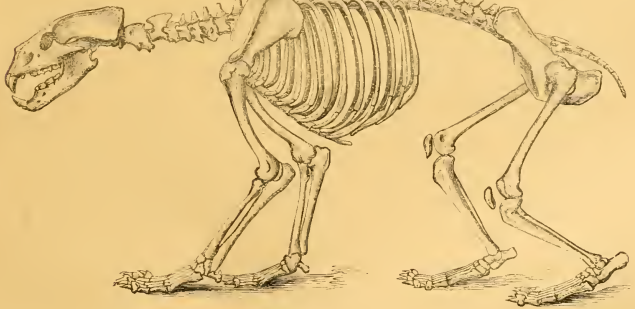
The skull of nearly all Carnivora is distinguished from that of most other Mammals by its immense strength, and its evident adaptation to the habits of its possessor—to the effective seizing and devouring of living prey. It is remarkable for the immense roughened bony ridges, developed in many parts of it, which serve for the attachment of the mighty jaw-muscles, the great size of which causes an increase in the width of the bony *jugal arch* extending from under the eye to just in front of the ear. Another point worthy of notice is the great shortening of the jaws, or of the *facial* in relation to the *cranial* portions of the skull. In this respect Carnivores, especially the most typical forms, the Cats, are very markedly distinguished from Herbivores, in which the brain-case is small and the face immensely prolonged. This has to do with the different kind of food used by the two groups—that of vegetable-eaters requiring long grinding, that of flesh-eaters powerful mincing. Connected also with this same function of mastication is the form of the *condyle*, or bony projection of the lower jaw, by which it moves on the skull, and of the smooth surface of the latter which receives it. These are in Carnivora greatly elongated transversely, and narrowed from before backwards, so that no motion from side to side, but only an up-and-down motion, is possible. The higher Carnivora, therefore, cannot *chew* or *grind* their food, but only *mince* it, their sharp teeth acting exactly like scissor-blades. In the interior of the skull should be noticed a large plate of bone which extends inwards and separates the great brain, or cerebrum, from the lesser brain, or cerebellum, and prevents the jarring of that important organ likely to arise from the animal's vigorous movements.



SKELETON OF LION.

In the spine, or vertebral column, there is not much to notice beyond the great size of the first two vertebræ, or those which support the head, and the development of strong spines or processes for the attachment of muscles.

In the limbs there are certain points of considerable interest and importance. If a Bear and a Lion be watched while walking, a great difference will be observed in their gait: the Bear's movements are far clumsier and less springy than those of the Lion. A little further observation will show that this is due, chiefly, to the manner in which their feet are set on the limbs, for it will be seen that the Bear keeps the sole of his foot flat on the ground, and, as his foot is very large, he has something of the awkward, sprawling movement of a man walking in shoes too big for him. The Lion, on the other hand, has his wrist and his heel lifted well above the ground, and so walks, not on the sole of his foot, but on his toes, the under surfaces of which are furnished with beautifully soft leathery pads, so as to ensure a soft, silent footstep. Then what looks like the knee of a Lion, Cat, or Dog is really his *wrist*.



SKELETON OF POLAR BEAR.

and what looks like a backward turned knee in his hind leg is his heel, the true elbow and knee being almost hidden by the skin.

The reason of this arrangement is seen by looking at the skeletons of the two animals. In the Bear the *metacarpals* and *metatarsals*, or five long bones extending between the wrist and the ankle respectively, and the joints of the toes, are kept in a horizontal position, as in ourselves; in the Lion, on the contrary, the metacarpals and metatarsals are lifted almost into a vertical position, the walking surface being now afforded by the under surface of the toe-bones, or phalanges. By reason of this the Lion gets an extra lever in his leg, in addition to the two levers which the Bear possesses, namely, those afforded by the bones of the arm and fore-arm and of the thigh and leg respectively; and consequently his springiness is greatly increased. An animal which walks like the Bear, on the sole of its foot, is said to be *plantigrade:* one which walks on its fingers, like the Lion, Cat, or Dog, is called *digitigrade*.

As in all animals in which the fore limbs are used for support, and not for prehension, the collar-bone, or clavicle, is either wholly absent or quite rudimentary, and the fore limb has therefore no bony connection with the trunk, but is attached simply by muscles and ligaments. The Carnivores, in leaping or running, often come down with their whole weight upon the fore legs, and if a large bony clavicle, like that of a Monkey or Bat, were present, it would infallibly be broken.

The bones are all strongly bound together by elastic bands, or *ligaments*, and are covered by the great fibrous masses, or *muscles*, which, forming as they do the flesh, take the chief share in giving to each animal its characteristic shape. These muscles are, in most instances, attached to the bones by strong cords or bands resembling the ligaments, and called *tendons*. The bones being, in great measure, articulated or jointed to one another by smooth surfaces, sometimes flat, sometimes round, sometimes pulley-like, act as levers. The muscles are usually attached at one end to a fixed at the other to a movable bone; when they act, by shortening in length and widening in diameter, they make the more movable bone to turn upon the other. In this way they cause the limbs to be straightened or bent, the jaws to be opened or shut, the claws extended or retracted, and perform all the other movements of which the animal is capable. The development of the muscles in the larger Carnivora is wonderfully great. A Lion will kill an Ox with a blow of his paw, and drag it off to his lair as easily as his humble relation, the Cat, disposes of a Rat or Mouse.

We now have to consider a most important series of organs—the organs of *alimentation* or *nutrition:* those, in fact, which serve the purposes of taking in, preparing, and digesting the food. They are the mouth with its tongue, teeth, and salivary glands, the gullet, stomach, and intestines, with the liver, and sweetbread, or pancreas.

We are all familiar in ourselves with *four* kinds of teeth, namely (1), the "incisors," or cutting teeth, in front; (2), the "canines," the pointed eye-teeth that come next; (3), the "false grinders," or "premolars;" and (4), the true grinders, or "molars." Man has a very even and full-mouthed series; the Carnivora, on the other hand, possess a most irregular series, and in this series there are certain gaps or interspaces. Our own even orderly set is best adapted for a mixed diet, that has for the most part undergone a great amount of change by cooking. But the Carnivora, in their wild state, must eat flesh raw, and for the most part reeking, and this has to be torn from the conquered prey. So that the teeth have to be applicable to the first, or destructive process, and then to the tearing to pieces of the fleshy substance, and the scraping of the bones; they may even have to crush the bones themselves, the more spongy parts serving for food; and, greatest feat of all, to break the hardest long bones for the succulent marrow.

The mode of feeding and the form and number of the teeth of necessity correspond: tearing and gnawing are processes that need teeth like knives and scissors, while grinding or chewing require teeth like millstones. Both these kinds exist in the Bear. In the Dog the crushing teeth become less in size and importance: in the Lion they are suppressed, and all the teeth have a cutting character, their number being at the same time much reduced.

The teeth are often all that remains of certain extinct creatures; they are, therefore, a most important part of the anatomy of an animal, as well as being of great service in the matter of classification or grouping. They are the hardest of all the organs: their relation to the food of the

species, and their necessary correlation to the digestive organs, makes them serve as a key to the rest of the creature's structure, which structure is in absolute harmony with its habits and daily life.

STOMACH OF LION.

The tongue is covered with horny projections, or papillæ, and in the Cat tribe serves as a rasp to rub and scrape off the smaller fragments of flesh from the bones. The stomach is always simple, that is, consists of a bagpipe-like cavity not divided into compartments, as in the Ruminants and some other animals. A great difference from herbivorous animals is also seen in the length of the intestine. As the food is of a highly nourishing nature it requires less time for its digestion, and a smaller surface for its absorption into the blood, and the intestine is therefore remarkably short—not more than three times the length of the body in the Lion and Wild Cat, instead of being fifteen to thirty times the length, as in some vegetable feeders. The Carnivora have, therefore, the manifest advantage of a more compact and smaller "barrel" than the Herbivora, and, in consequence, have less weight to carry, and are slim and slender-waisted.

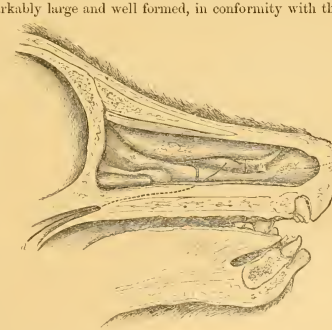
BRAIN OF DOG.

As might naturally be expected, the organs by which the blood, loaded with nourishment from the digestive canal, is carried to all parts of the body, are well developed. The heart, if not "as hard as the nether millstone," is yet compact and strong in the highest degree: the circulation is vigorous, and the result is seen in great courage and astonishing powers of endurance.

In the lungs, with the windpipe and larynx, in which the multitudinous cries of the group—barks, howls, roars, and whines—are produced, there is nothing to merit any special mention.

The brain of Carnivora is, as a rule, remarkably large and well formed, in conformity with their high degree of intelligence. Its surface is thrown into well-marked ridges with intervening depressions, and presents a great contrast with the almost smooth brain of a Shrew or a Hedgehog. From it are given off nerves to the tongue, teeth, skin, muscles, and other parts of the head, as well as some to organs at a considerable distance from the head, as the heart, lungs, and stomach, and, most important of all, three pairs of nerves, one for each of the organs of the higher senses—the nose, eye, and ear.

The two nerves of smell pass through a beautifully-perforated bone—hence called the "sieve-bone," or *ethmoid*—and proceed one on each side of a bony and gristly wall which divides the two nasal chambers from one another, to a delicate membrane covering a pair of bones of wonderful complexity—a labyrinth which must be seen to be understood, for the beautiful manner in which it enfolds itself can hardly be imagined. These "spongy-bones," as they are called, the membrane covering which forms the true organ of



LONGITUDINAL SECTION THROUGH A DOG'S NOSE, SHOWING THE SPONGY BONES. (*Nat. Size. From a Sketch by T. J. Parker.*)

a. The smelling region; *b*. The sneezing region; *c*. A bristle passed through the nostril into the nasal chamber; *d*. A bristle passed from the nasal chamber into the passage by which the latter communicates with the mouth.

smell, lie in the upper and hinder part of each nasal cavity, but in front of them is a large scroll of bone, also covered by a membrane of exquisite sensitiveness, but not taking cognisance of odours. This anti-chamber, as it were, of the nose, is extremely sensitive, and its sensibility is a safeguard against intrusive dust, and deadly disease-germs. It is the *sneezing* region, and is the natural and most careful porter of the gates of the breath.

The way in which the eyes of the Carnivora are set in their head indicates their habits of life. They look straight forward, and are expressive, in the nobler kinds, of the energy and cruelty of their owner's disposition. As in many of the Lemurs, the eye possesses what is called a *tapetum*, a sort of reflecting mirror in the bottom of the eye, which redoubles, as it were, the faint rays of evening, evidently a very important thing for these, mostly nocturnal, animals.

The sense of hearing is as perfect as that of sight; not, perhaps, in the higher, musical sense of the word, but for catching the faintest and feeblest undulations of the air. The Mole is supposed to be most sharp of hearing; but it is a question whether he is quicker of hearing than his cruel neighbour the Rabbit-killing Weasel. Any one who has watched a Cat sitting demurely by a Mouse-hole, or a Terrier on the look out for a Rat, will give these Carnivores credit for the most acute sense of sound. Anatomy corroborates what simple observation suggests, and the internal as well as external organs of hearing in the Carnivora are most exquisitely perfect.

Many members of the group live in families, that is, a male and female with their young form a little *coterie* by themselves, and associate very little with other families. Very few live in great societies or herds, after the manner of the grass-eating animals, such as Oxen, Antelopes, or Wild Horses, but an exception to this is afforded by the Wild Dogs of Constantinople, which roam the streets in great numbers, and by Wolves, which invariably hunt in packs.

The Dogs and Wolves, besides being gregarious, resemble the Herbivora in another and far less amiable characteristic, that is, they do not choose a mate for life or even for a season, but let their affections run wild and practise the most unmitigated polygamy and polyandry. Many of the larger Cats, on the contrary—the Lion, for instance—choose a mate, to whom they are wonderfully faithful.

The young are always born in a comparatively helpless condition, not able to run about at once like a new-born Calf or Foal; they are generally blind for some time after birth, and are entirely dependent on the mother for food and warmth.

The higher Carnivora are most kind parents, and to the best of their ability, *educate* their young. This was well known to the ancients: Ezekiel the prophet (xix. 2, 3) gives this character of the Lioness in inimitable language: "What is thy mother? A Lioness: she lay down among Lions, she nourished her whelps among young Lions. And she brought up one of her whelps: it became a young Lion, and it learned to catch the prey; it devoured men." All writers bear witness to the painstaking way in which the parent Lion or Tiger trains up its young and practises them for their trade of slaughter. Sometimes both parents, sometimes only one, go out with their offspring, and by example and precept show them the safest places to hide, the proper moment to spring, the best place to seize the victim, and so on. And the future tyrants are very apt, they thoroughly enjoy their schooling, and make the best possible use of their opportunities; so much so that the young of the great Cats are far more dreaded than the old ones, as they not only kill to satisfy hunger, but commit wholesale slaughter, simply for practice and to keep their paws in.

The diversity of form and structure in the group of land Carnivora is very great. We find, as in the groups we have considered previously, many different kinds or *species*, amongst which are creatures so different as the great and powerful Lion and the small and insignificant Weasel, the active Tiger and Jaguar, and the lazy Glutton. These species, as very little observation shows us, naturally fall into certain larger groups or *genera*, having important characteristics in common; for instance, the Lion, Tiger, Leopard, Jaguar, Lynx, and all the small Cats, are so much like one another, and so different from all other animals, as to be put in the one genus *Felis*, which is distinguished by having retractile claws, and by being quite devoid of true grinding teeth. Again, the Dog and Wolf have so many points in common, that they are placed in the single genus *Canis*, the Dog being called *Canis familiaris*, the Wolf *Canis lupus*. If a number of genera are found to agree pretty closely with one another in essential matters, they are grouped into a *family*; thus

we have the family *Mustelidæ*, which includes not only the Weasel (*Mustela*), but a number of other genera, such as the Otter, Badger, Skunk, and many others. Furthermore, the families are conveniently grouped into *sub-orders*, according to characters considered to be of greater importance than those which determine genera or families. We may roughly compare this method of grouping to the way in which the soldiers in an army are arranged. Thus, individual men—corresponding to species—are arranged in *companies*, which we may take to represent genera; several companies are united into a *regiment*, just as a number of genera are united into a family; a greater or less number of regiments go to form a *battalion*, in the same way as the families go to form a sub-order; and, lastly, two or three battalions constitute an *army*, which is the complete assemblage, and corresponds, in our rough illustration, to an *order*.

We suppose that nine persons out of ten, if asked to give three common examples of land Carnivores, would, almost without hesitation, name the Cat, the Dog, and the Bear. The most accomplished naturalist would be unable to give a better answer to this question, as those three well-known animals are types of the three primary sections into which the whole sub-order is divided, and which may, in fact, be termed respectively the groups of the Cats, Dogs, and Bears. It must be borne in mind, however, that the words are here used in the broadest and most general sense, for the group of "Cats" includes not only the animals properly so-called, but also the Civets, Ichneumons, Hyænas, whilst amongst "Bears" are grouped Racoons, Otters, Badgers, Weasels, and many others.

It will, perhaps, be as well to give the scientific names for these three groups which we have, most unscientifically, called Cats, Dogs, and Bears. We have first the *Æluroidea*,* or Cat-like animals; next the *Cynoidea*,† or Dog-like animals; and, lastly, the *Arctoidea*,‡ or Bear-like animals. We also give below a list of the families of land Carnivores arranged under their respective sections, with the most important forms belonging to each family; as such a list will, in all probability, be useful for reference.§

The splitting up of our flesh-eaters into these sections is not an arbitrary matter, but is determined by certain definite anatomical characters, one of the chief of which is the structure of the base of the skull. These matters will, however, be better discussed under the various families, when we shall also devote a short time to that very important branch of anatomy, the form, number, and arrangement of the teeth.

THE CAT FAMILY.

This is the chief of the families of Carnivora, containing as it does all the great beasts of prey. Its members are the most perfectly constructed of animals for a life of rapine; their weapons—teeth and claws—attain the utmost degree of perfection, and their elegant form, silent movements, and often beautiful colouring, make them in every respect the culminating forms of the flesh-eating group, and one of the chief of the upper branches of the great Mammalian tree.

* From the Greek, αἴλουρος, a Cat, and εἶδος, form. † From κύων, a Dog. ‡ From ἄρκτος, a Bear.

§ Section I.—ÆLUROIDEA (Cat-like animals).
Family 1. *Felidæ* (the Cat family).
Examples: Cat, Lion, Tiger, Leopard, Jaguar, Puma, Ocelot, Serval, Lynx, Cheetah, &c.
Family 2. *Hyænidæ* (the Hyæna family), contains the Hyænas only.
Family 3. *Cryptoproctidæ*, the Cryptoprocta only.
Family 4. *Protelidæ*, the Aard-Wolf only.
Family 5. *Viverridæ* (the Civet family).
Examples: Civet, Genette, Ichneumon, Suricate, Binturong, &c.
Section II.—CYNOIDEA (Dog-like animals).
Family 6. *Canidæ* (the Dog family).
Examples: Dog, Wolf, Fox.
Section III.—ARCTOIDEA (Bear-like animals).
Family 7. *Ursidæ* (the Bear family).
Examples: The various kinds of Bear.
Family 8. *Procyonidæ* (the Racoon family).
Examples: Racoon, Coati, Kinkajou, Cacomixle.
Family 9. *Ailuridæ*, contains the Panda only.
Family 10. *Mustelidæ* (the Weasel family).
Examples: Weasel, Stoat, Ferret, Badger, Skunk, Ratel, Glutton, Marten, Polecat, Otter.

‖ *Felidæ*.

Both the Old and New World are well stocked with Cats. Everywhere they are the correlates, geographically speaking, of the beautiful forms of the Herbivora, and are their natural checkmates in the earth-peopling process. Their terrible office is to cull out the surplus number of Goats, Antelopes, Deer, Oxen, and Sheep; they also are not good neighbours to the Monkey tribes, nor to Rats, Cavies, Hares, Squirrels, and other gnawing animals. The smaller Cats also add feathered game to their diet. Everywhere they are the terror of woodland and of field, of plain and of forest. All are of the kindred of the Lion, and, like him, all "go about, seeking whom they may devour."

Man has half tamed one of the smallest—we say *half tamed*, for does not the demon that possesses all Cats still only slumber in the heart of the tamest domestic variety? As for the Hunting Leopard, he is deceived in the services he renders, and, in his own mind, is hunting for himself, and not for his master.

It is only necessary to mention the animals belonging to this noble family of "gentlemen caterers" to assure oneself that in it are contained the best known, the most skilled, the most perfectly armed of all the Carnivorous order. We have the Wild Cats existing under many forms nearly all over the world, the Lion the great tyrant of Africa, the Tiger the despot of India, the Puma and Jaguar taking their place in America, the Leopard helping the work of the Lion and Tiger in Africa and Asia, the Lynxes found in both Old and New Worlds, and the Cheetah, or Hunting Leopard of Asia and Africa. To these need only be added the Wolf, Hyæna, and Bear, to exhaust the list of "beasts of prey" in the ordinary acceptation of the term, that is, of beasts which are dangerous to man, for we "lords of creation" are not sufficiently generous to include under the term beasts of equal cruelty which prey on the lower animals.

By most naturalists all these animals are grouped together under the single genus *Felis*, which is thus said to include a great number of species, as *Felis leo* (the Lion), *Felis tigris* (the Tiger), *Felis catus* (the wild Cat), &c. It is very usual to separate from the rest the Hunting Leopard, and make it constitute by itself a distinct genus, *Cynelurus*, or *Gueparda*, distinguished from its cousins by its great length of leg, and a slight difference in the form of its teeth. Some naturalists separate, in addition, the Lynxes, making of them the genus *Lyncus*, and others, again, prefer to make separate genera of all the chief kinds, calling the Lion *Leo nobilis*, the Tiger *Tigris regalis*, and so forth. This separation or union is, however, a mere conventional matter, and we prefer to consider all *Felidæ* as belonging to the one genus *Felis*, as the simplest and most comprehensible plan.

The *Felidæ* are found over almost the whole world, being absent only in Australia, New Zealand, the south-eastern part of the Malay Archipelago, the Polynesian Islands, Madagascar, and the Antilles. In all other parts of the world Cats—using the word in a wide sense—are found, and, wherever they are found they are feared, for such a compact assemblage of bloodthirsty tyrants and ruthless destroyers has no parallel in the whole animal kingdom.

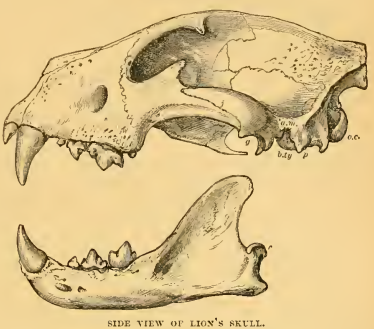
Remains of fossil Felidæ have been found as far back as the Miocene or even the Eocene epoch, in the South of England, and Central and South Europe, in North-west India, in Nebraska, in North America, and in the caves of Brazil. Of these the best known is the great cave Lion or Tiger, the *Felis spelæa*.

Every part of these animals is so altered and specialised from the usual type of Mammalian structure as to assist in the best possible way the capturing, killing, and devouring of living prey. Looking merely at the outside, we are struck with the lithe, agile form, the small head, the total absence of anything like a "pot-belly," the well-proportioned limbs, the usually close fur, the stealthy, silent movements, and the eager, restless glance: all characters suited to an animal to which powers of quiet rapid movement through jungle or long grass, of quick observation, and of great strength and agility, are of the utmost importance.

In the skeleton there are two points of importance, as relating both to the habits of the Cat tribe and to the determining of their systematic position in zoology. These are the character of the skull, and the structure and arrangement of the bones of the toes. Both these points furnish characters by which the Cats may be separated from all other families. To these two points, therefore, we will proceed at once, as, without going into lesser details, there is nothing of special importance in the

vertebral column, large limb bones, &c. All the points mentioned in the introduction to the group as being characteristic of the Carnivorous type of skull are here carried to their extreme. The bony ridges for the attachment of the jaw-muscles are immense; the jaws attain their utmost limit of structure and strength, and the lower jaw being perfectly incapable of motion from side to side, the teeth, as we shall see by-and-by, act like scissors and not like mill-stones.

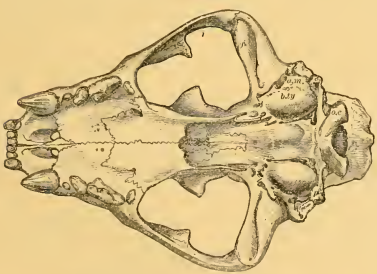
If the skull of a Cat be examined, there will be seen on its under surface, near the hinder end, a pair of rounded swellings, directed somewhat obliquely. On looking at the skull from the side, there is seen to be a roundish aperture, the auditory meatus, leading into each of these swellings, which are found to be thin-walled half globes, stuck on, as it were, to the under surface of the skull. Round the aperture is fixed, in the living state, the Cat's prominent external ear, and stretched across it, like the parchment of a drum, is a thin membrane, which vibrates with every sound. The rounded cavity is called the "drum of the ear," the membrane stretched across it the "drum membrane," or "tympanic membrane," and the bony half-globe, which forms the floor of the drum cavity, is the "bulb of the drum," or *bulla tympani*.



SIDE VIEW OF LION'S SKULL.

a.m, auditory meatus; *b.ty*, bulla tympani; *j*, jugal arch or zygoma; *o.c*, occipital condyle for the articulation of the skull with the first vertebra; *c*, condyle of the lower jaw; *g*, glenoid cavity with which the condyle of the lower jaw articulates; *p*, the bony clamp, or paroccipital process.

Closely pressed against the hinder wall of this bulla is a sort of bony clamp, which seems to keep the bulla in its place, and running obliquely along the surface of the swelling is an indistinct groove, corresponding to which, in the interior of the drum, is a bony wall, dividing the drum cavity into an inner and an outer compartment, these two divisions being formed from separate bones, as an examination of a very young skull will show.



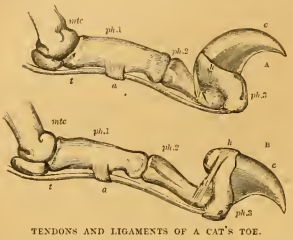
UNDER VIEW OF LION'S SKULL.

The letters have the same significance as in the side view.

The almost globular form and great relative size of the *bulla tympani;* the absence of any distinct bony passage leading from its cavity to the interior, the opening being quite flush with the wall of the drum; and the division of the cavity into two parts by a bony partition, are all very important as distinctive characters of the Cat family, and also, with lesser modifications, of the whole Æluroid group.

The power of retracting the claws, so characteristic a feature of all the true Cats (which are, without exception, digitigrade), is brought about by certain peculiarities of structure of the last two joints of the toes. Of the three *phalanges*, or bones which make up the skeleton of the toe, the first, or that nearest to the wrist or ankle, is of the ordinary shape: about three times as long as broad, with a regular cylindrical shaft, and pulley-like ends, for articulation with the bone to which it is joined. The second, or middle phalanx, is pretty much like the first, except that its shaft is scooped out on one side, so as to make a greater distance between it and the corresponding bone of the next toe than there would otherwise be. The third and last joint, called

the *ungual phalanx*, from the fact of its supporting the claw, has the regular pulley-surface to articulate with the preceding joint, but its farther end is strongly curved downwards and pointed at the end; it has, in fact, the shape of the horny talon of which it forms the supporting core. Further support is afforded to the claw by an outgrowth of the phalanx, which commences near its articular end, and grows over the end of the claw like a sort of hood, thus giving the ungual phalanx of the Cat a most peculiar and unmistakable shape. Between the upper surfaces of the last phalanx and the last but one passes a strong and very elastic ligament, which so pulls upon the ungual phalanx as to bend it on its predecessor, and so cause the two to be almost parallel, the hood of the claw-bearing bone being received between the preceding joint of its own toe and that of the next; hence the scooping out of the middle phalanges. Thus, by the action of this ligament, the claw under ordinary circumstances is pulled back within its covering of skin, which forms for it a sort of protecting pouch, and effectually prevents its being worn down by rubbing against the ground. But when the Cat strikes its prey, it bends the paw upon the wrist by means of the strong *flexor* (or bending) muscles, which are placed along the under surface of the fore-arm and hand. The end of the string-like tendons of one of these muscles divides into four slips, one for each toe, and, running along the under surface of the first two phalanges, is inserted into the corresponding surface of the third, and, this under surface being bent upwards by the elastic ligament, the tendon is, when the claw is retracted, put upon the stretch. But when the flexors come into play, they pull upon the ungual phalanx, causing it to turn through a quarter-circle upon its articulation, and thus protruding the claw from its pouch. Immediately the flexors relax the elastic ligament is again allowed to act, and the claw springs back into its place of repose.



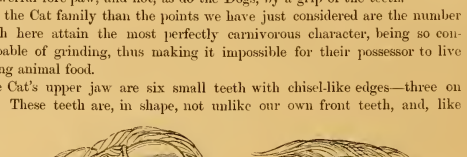
TENDONS AND LIGAMENTS OF A CAT'S TOE.
(Twice Natural Size. From a Sketch by T. J. Parker.)

A, with the claw retracted; B, with the claw exserted; *mtc*, the metacarpal; *ph.1*, the first; *ph.2*, the second; *ph.3*, the third phalanx; *b*, the bony "hood;" *c*, the claw; *t*, the elastic ligament; *t*, the flexor tendon; *o*, a ligamentous loop, through which the tendon passes.

This arrangement is of great importance, as the Cat family always attack their prey in the first instance by a stroke of the powerful fore-paw, and not, as do the Dogs, by a grip of the teeth.

Not less characteristic of the Cat family than the points we have just considered are the number and form of the teeth, which here attain the most perfectly carnivorous character, being so constructed as to be wholly incapable of grinding, thus making it impossible for their possessor to live upon any but highly nourishing animal food.

In the front part of the Cat's upper jaw are six small teeth with chisel-like edges—three on each side of the middle line. These teeth are, in shape, not unlike our own front teeth, and, like them, are single-fanged, but their small size, when compared with those that follow, is remarkable. They are borne by a bone quite distinct in young skulls from that which carries the other teeth—the premaxillary bone—and are, therefore, classed as *incisor* teeth. Corresponding with them in the lower jaw are six similar teeth—the lower incisors; so that the incisors of the Cat are said to be $\frac{3-3}{3-3}$, that is, three on each side above and below.

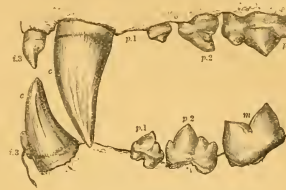


LION'S CLAW, SHEATHED AND UNSHEATHED.

Following the last incisor, and separated from it by a short interval, comes on each side in both jaws a long, pointed fang, the chief means by which the Cats seize and hold on to their prey. These are the *canines*, or dog-teeth, and correspond to the "eye-teeth" in ourselves, those adze-like teeth immediately following and slightly projecting beyond the last incisor. When the mouth is closed

the lower canines are seen to bite in front of the upper, and to fit into the space between the latter and the incisors. The canines of the Cat are written thus, $\frac{1-1}{1-1}$.

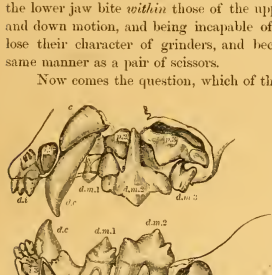
Following the canines, but separated from them by a slight interval or *diastema*, are, in the upper jaw four, in the lower three teeth, which correspond to our "grinders," or molars and premolars. In the upper jaw the foremost tooth of this set is as small as one of the incisors, and its crown is simple, or nearly so. The next two teeth are larger and have sharp, cutting edges, divided into three points, or *cusps*. The second of these two teeth is much the larger, its edge is more blade-like, and the front part of its inner edge sends off a strong blunt process, which is supported by a distinct root, so that this tooth has three roots instead of two like its predecessor; it is also of much greater size than any of those in front, and, biting like a scissor-blade against the corresponding tooth of the lower jaw, is called the *sectorial*, or *carnassial* tooth. Behind it comes the last of the set, a small tooth with a transversely-set, almost flat crown.



PERMANENT TEETH OF LION.
i. 3, the third incisor; *c*, the canine; *p.* 1, *p.* 2, *p.* 3, the premolars; *m*, the molars.

In the lower jaw, the grinding series is represented by only three teeth, all more or less resembling the second of the series in the upper jaw. Of these the third is the largest, and is called the lower carnassial, biting, as it does, against the upper tooth of that name. In every case the teeth of the lower jaw bite *within* those of the upper, and, the jaws being so articulated as to allow only of up and down motion, and being incapable of play from side to side, the molars and premolars entirely lose their character of grinders, and become trenchant, cutting up the food, in fact, in precisely the same manner as a pair of scissors.

Now comes the question, which of these teeth are premolars, and which molars? This is decided by finding which of them have their place occupied in the young kitten by its first set of back-teeth, the *deciduous* or *milk molars*, and which, on the other hand, have no predecessors: those which replace the milk-molars being the premolars of the adult, those which arise as altogether new teeth, and have no representatives in the young animal, molars. The examination of a young Cat shows that there are, behind the canines, in the upper jaw three, and in the lower two teeth; that is to say, one less on each side of each jaw than in the adult. As age advances these deciduous or milk molars all drop out, and are replaced by the permanent premolars, while behind the last milk molar of each jaw an entirely new tooth makes its appearance—the true or permanent molar. Thus it is seen that only the last tooth in each jaw is a molar, and that the carnassials are of different natures in the two jaws, the upper being the last (third) premolar, the lower the single molar.



MILK TEETH OF LION, EXPOSED BY CUTTING AWAY THE OUTER PORTIONS OF BOTH JAWS.

(*Natural Size. From Owen, after Rousseau.*)

di, deciduous incisors; *dc*, deciduous canines; *dm.* 1, *dm.* 2, *dm.* 3, deciduous molars. The remaining letters have the same significance as in the preceding figure.

We therefore write the premolars of the Cat $\frac{3-3}{3-3}$, and the molars $\frac{1-1}{1-1}$, so that the whole "dental formula" is as follows:—*i.*, $\frac{3-3}{3-3}$, *c.*, $\frac{1-1}{1-1}$, *p.*, $\frac{3-3}{2-2}$, *m.*, $\frac{1-1}{1-1} = 30$. In the milk dentition, the number of incisors and canines is the same as in the adult, and, as we have just stated, the molars are absent, so that the formula is *di.*, $\frac{3-3}{3-3}$, *dc.*, $\frac{1-1}{1-1}$, *dm.*, $\frac{3-3}{2-2}$, $= 26$, *di, dc, dm*, standing for deciduous incisors, canines, and molars.

The tongue in this family becomes an important adjunct to the teeth, almost losing its character as a delicate organ of taste. The little elevations or papillæ which beset the tongue in all animals—in ourselves for instance—are formed into strong horny spines set closely together like the teeth of a file, and, as may be seen any day at feeding-time at the Zoological Gardens, used to rasp the flesh from the bones as effectively as any file would do it. Most people must have noticed the different

texture of a Cat's and a Dog's tongue. In the latter it is as smooth as in ourselves, in the former it has more of the texture of a piece of coarse sandpaper.

In some *Felidæ*, such as the Domestic Cats, the pupil, or small aperture in front of the eye which lets in light to the sensitive retina beyond, has the round shape it possesses in man, only in the dark, when it is dilated to receive every ray of light available. In the day, on the other hand, when more light is to be had than the animal requires, the pupil contracts to an ellipse, or in the strongest light to a mere line. This is not the case in the larger Cats, such as the Lion, Tiger, and Leopard, in which also the eyes themselves and the cavities in the skull for their reception are smaller, proportionally, than in the Domestic Cat.

Taking the structure of the Cat tribe, all in all, there is nothing whatever to make it the least difficult to suppose that they all sprang from one stock, and that size and colour, and every other point in which they now differ from each other, may have been brought about, through long periods of time, as the result of the influence of their surroundings. It is necessary to presume this, for classifiers from necessity lay hold on the most minute differences, for the sake of making proper specific distinctions, although these differences may be merely the outcome of some change of locality, warmer, or colder, drier, or moister, higher upon the hills, or lower down on the plains. Once developed, however, it becomes hereditary, and then a *variety* becomes a *race*, and a race solidifies into a *species*. Yet, the result once obtained, however it arose, the profit is great to us who are careful observers and enthusiastic admirers of the infinite fecundity of Nature.

CHAPTER II.

THE CAT FAMILY—THE LION.

THE LION—Its Geographical Distribution at the Present Day and in Ancient Times—Its Haunts—Varieties of the Lion—Distinction between the Lion and other Cats—Its Courage, Speed, and Strength—Its Roar—Its supposed Magnanimity—Its Habits—Man-eating—Occasional resort to Vegetable Diet—Love-making—The Lion-cubs and their Education—Old Age—Breeding in Captivity—Lion-hunting.

THE LION.*

THE "King of Beasts" must, of course, be placed at the head of our list of beasts of prey, for although he is excelled in size and ferocity by the Tiger, in elegance of form by the Leopard and Jaguar, and in beauty of colouring by most of the great Cats, yet it would be useless, even if it were advisable, to depose him from the throne he has, by the universal consent of mankind, so long occupied. And, truly, who would wish to uncrown him? He is anything but an amiable beast—cruel and cowardly, greedy, treacherous, noisy, and self-asserting, never forgetful of the "divine right of kings" to prey upon their subjects; but still he is quite on a level, in the matters of morality and fitness to reign, with a very large proportion of his brother sovereigns of the genus *Homo*, with whom he well deserves a place in that limbo where, according to the mildly-spiteful poet of Olney, dwell "all that ever reigned" of the kings of men.

The Lion is entirely confined to the Old World, where it ranges through Africa from Barbary to Cape Colony, and extends into the south-west corner of Asia, where its range just overlaps that of the Tiger. Except in this "debateable land" the two monarchs keep clear of one another, the Lion keeping court over Africa and South-west Asia, and the Tiger ruling in Southern and Eastern Asia, the most important pretender in either kingdom being the Leopard.

With respect to the subject of distribution of the Lion in ancient times, we will quote from a late able writer. "That Lions were once found in Europe there can be no doubt. Thus it is

* *Felis leo.*

recorded by Herodotus that the baggage camels of the army of Xerxes were attacked by Lions in the country of the Paeonians and Crestonei, on their march from Acanthus (near the peninsula of Mount Athos) to Therme, afterwards Thessalonica (now Salonika). The camels alone, it is stated, were attacked, other beasts remaining untouched as well as men. The same historian also observes that the limits in Europe within which Lions were then found were the Nessus or Nestus, a Thracian river running to Abdera, and the Achelous, which waters Acarnania. Aristotle mentions Europe as abundant in Lions, and especially in that part which is between the Achelous and Nessus, apparently copying the statement of Herodotus. Pliny does the same, and adds that the Lions of Europe are stronger than those of Africa and Syria. Pausanias copies the same story as to the attack of the Lions on the Camels of Xerxes; and he states, moreover, that Lions often descended into the plains at the foot of Olympus, which separates Macedonia from Thessaly, and that Polydamas, a celebrated athlete, a contemporary of Darius Nothus, slew one of them, although he was unarmed. The passage in Oppian, which some have considered as indicating the existence of Lions up to the banks of the Danube, fails, as an authority, for placing the Lion in that locality, because, as Cuvier observes, the context shows plainly that the name of Ista is there applied to an Armenian river, either by an error of the author or of the transcribers."

Nor is Europe the only part of the world from which the form of the Lion has disappeared. Lions are no longer to be found in Egypt, Palestine, or Syria, where they were once evidently far from uncommon. The frequent allusion to the Lion in Scripture, and the various Hebrew terms there used to distinguish the different ages and the sex of the animal, prove a familiarity with the habits of the race. Even in Asia generally, with the exception of some countries between India and Persia, and some districts of Arabia, these magnificent beasts have become comparatively rare; and this is not to be wondered at. To say nothing of the immense draughts on the race for the Roman arena—and they were not inconsiderable, for there were a thousand Lions killed at Rome in the space of forty years—population and civilisation have gradually driven them within narrower limits, and their destruction has been rapidly worked in modern times since firearms have been used against them instead of the bow and the spear. The African Lion is annually retiring before the persecution of man farther and farther from the Cape. Mr. Bennett * says of the Lion: "His true country is Africa, in the vast and untrodden wilds of which, from the immense deserts of the North to the trackless forests of the South, he reigns supreme and uncontrolled." In the sandy deserts of Arabia, in some of the wild districts of Persia, and in the jungles of Guzerat, in India, he maintains a precarious footing; but from the classic soil of Greece, as well as from the whole of Asia Minor, both of which were once exposed to his ravages, he has been utterly dislodged and extirpated.

The fearful custom, so common afterwards among the Romans, of having many encaged Lions, "fierce with dark keeping," to use Bacon's expression, for judicial as well as sporting purposes, was evidently an old custom in the East; for we learn from the book of Daniel that the kings of Babylon kept a "den of Lions" into which offenders were thrown alive. Judging, however, from the Biblical narrative, the Chaldeans had a far less revolting manner of killing criminals than the Romans, for they seem to have used the Lions simply as executioners; to have cast in the victim, and then to have fastened up the entrance of the den, drawing a decent veil on the horrible scene taking place within. They did not, like the Romans, curry favour with the masses by making the death of their victims into a spectacle, at which all classes had their love of excitement gratified by the sight of men and women torn and mangled and devoured by raging beasts, to the accompaniment of small talk and flirtation.

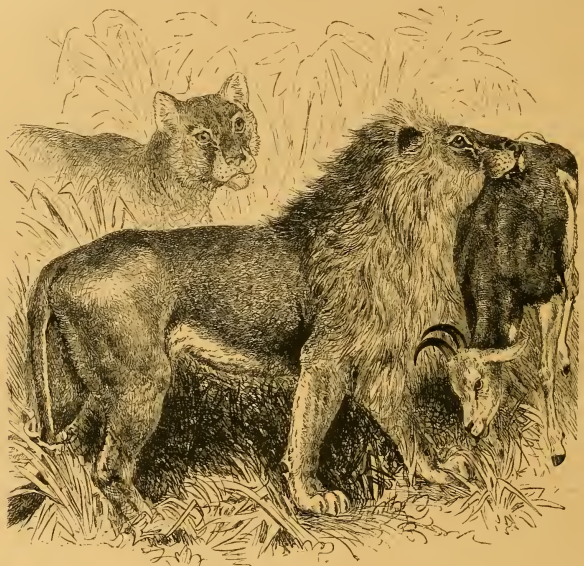
As to the former occurrence of the Lion in places where it is now absent, we may instance its evident commonness in Palestine. One of the earliest Lion stories occurs in the history of the Hebrew Hercules, who, when travelling with his father and mother to Timnath, "came to the vineyards of Timnath: and, behold, a young Lion roared against him. And the Spirit of the Lord came mightily upon him, and he rent him as he would have rent a kid, and he had nothing in his hand: but he told not his father or his mother what he had done."†

Every one will remember David's account of his encounter with the tawny savage in the Syrian

* "Tower Menagerie." † Judges xiv. 5, 6.

pasture lands. "And David said unto Saul. Thy servant kept his father's sheep, and there came a Lion, and a Bear, and took a Lamb out of the flock: and I went out after him, and smote him, and delivered it out of his mouth: and when he arose against me, I caught him by his beard, and smote him, and slew him. Thy servant slew both the Lion and the Bear."*

Another Lion-slayer is one of David's "braves"—Benaiah—"He went down also and slew a Lion in the midst of a pit in time of snow."† Now this slight mention of the forest-king is a perfect



LION OF SENEGAL.

picture in a few short words. In that land of milk and honey there was snow at certain seasons, and then that huge, bearded Cat was fain to hide himself in some cleft of the rock. If, however, the term "pit" means one in which the Lion has fallen, being entrapped, the short snatch of history loses none of its interest. The calm courage of this man made him to be "more honourable than the thirty mighty men," in the list of David's captains.

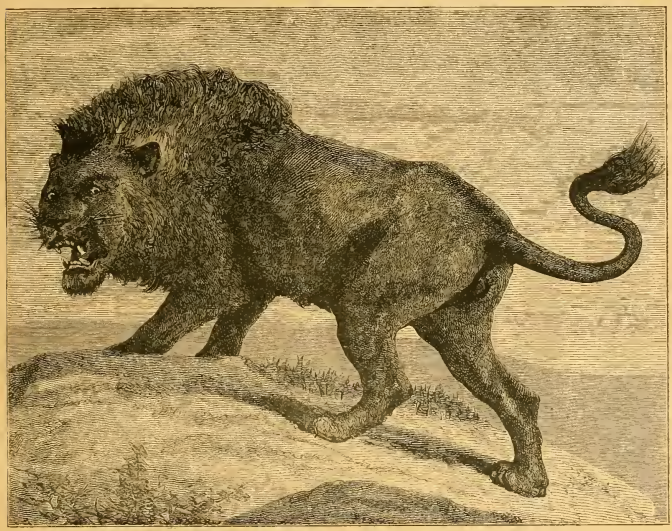
After the deportation of the ten tribes to Babylon, the number of Lions and other beasts of prey must have increased to a fearful extent in Palestine, for we find the men sent by the King of Assyria to re-people the deserted cities, complaining to their monarch of the ravages of these beasts which, as they put it, had been sent "because they knew not the manner of the God of the land."

As to the favourite haunts of the Lion in the various countries where it exists, "that Lions exist in the desert," says M. Carette, "is a myth popularised by the dreams of artists and poets, and has no foundation but in their imagination. This animal does not quit the mountains where it finds

* 1 Samuel xvii. 34-36. † 2 Samuel xxiii. 20.

shelter, food, and drink. When the traveller questions the natives concerning these wild beasts, which Europeans suppose to be their companions in the desert, they reply, with imperturbable *sangfroid*, 'Have you, then, Lions in your country which can drink air and eat leaves? We fear only the viper, and, in humid spots, the innumerable swarms of mosquitos which abound there.'" * But the sacred writer makes him come up from the "swellings of Jordan;" and with Homer he is the Mountain Lion: the "artists and poets" of M. Carette are *moderns*, who know but little of the subject; not *ancients* who were familiar with the beast.

When an animal has a wide geographical distribution it is almost always found that it exhibits, in different parts of its range, more or less well-marked varieties, distinguished from one another by



LION OF BARBARY.

evident though sometimes unimportant characters. This is the case with the Lion, of which five varieties are usually distinguished, three being found in Africa, and two in Asia. These varieties, or races, are as follows:—

1. *The Lion of Barbary.*—The fur is of a deep yellowish-brown colour, and the mane is more developed than in any other variety, forming long tresses which cover the neck and shoulders, and are continued along the belly and the inside of the legs. This variety extends over the whole of Africa north of the Sahara.

2. *The Lion of Senegal* is found in the western part of Africa, south of the Sahara. Its fur is of a lighter colour than that of the Barbary Lion, and the mane is less thick, and hardly at all developed over the breast and insides of the legs.

* Humboldt; "Views of Nature."

3. *The Lion of the Cape* ranges over the whole of South Africa, and is said to be found under two lesser varieties, one yellowish in colour, and the other brown: the latter is considered to be the more formidable. The mane is darker than in either of the foregoing kinds.

The Asiatic varieties are smaller than the kinds found in Africa. The mane is variable, and the form less graceful than in the Cape or Barbary Lion.

4. *The Persian or Arabian Lion.*—This is a paler variety found in Western Asia.

5. *The Lion of Guzerat*, or so-called "maneless Lion," is usually stated to be the best-marked variety of all, as its mane, though by no means absent, as the name of the variety would lead us to suppose, is very much less than in any other kind; the body also is bulkier and the legs shorter. Some writers, however, deny altogether the distinctness of the variety, and consider that the mistake of considering the Guzerat Lion as such, has arisen from the fact of young specimens having been described. The strongest statements we have met with on this head are by Captain Harris, whose words we will quote, as they show how little reliance is to be placed on the distinction drawn by travellers between closely-allied varieties or species. Harris says that the South African Lion does not differ "in any material points from those found in Guzerat, in Western India, measuring between ten and eleven feet in extreme length, but generally possessing a finer mane, a peculiarity which is attributable to the less jungly character of the country he infests, and to the more advanced age which he is supposed to attain. Amongst the Cape colonists it is a fashionable belief that there are two distinct species of the African Lion—the yellow and the black—and that the one is infinitely less ferocious than the other. But I need scarcely inform the well-instructed reader that both the colour and the size depend chiefly upon the animal's age; the development of the physical powers, and of the mane also, being principally influenced by a like contingency. That which has been designated the 'maneless Lion of Guzerat' is nothing more than a young Lion whose mane has not shot forth; and I give this opinion with less hesitation, having slain the 'king of beasts' in every stage from whelphood to imbecility."

There has been no attempt to divide the above-named varieties into distinct species. From Linnæus to Dr. Gray, all zoologists agree in this matter. Hence we see that animals do not vary under domestication only; but *wild* creatures also have their varieties or races, differing in the various localities in which they are found.

All these varieties together form a very well-marked species of the genus *Felis*, and are known as *Felis leo*, in zoological language. Some authors, however, as we have already noticed, prefer to consider the various kinds of Cat as so many distinct genera, and speak of the Lion as a single genus and species (*Leo nobilis*). The species, or genus—for it matters very little which we call it—is distinguished from other Cats by its uniform tawny colour, the tuft of hair at the end of the tail, and the flowing mane, which clothes the head, neck, and shoulders of the male. The head of the Lion is more square than that of the other species of Cats. The mane is entirely absent in the female, which is, in consequence, a comparatively ordinary-looking animal, as it is only by the grandeur of his hirsute appendage that the male is compensated for his plain colouring. The addition of the mane, however, gives him an immense advantage over all other species, adding to his apparent size, especially to that of the head, increasing almost infinitely the beauty of his form, and altogether making him one of the most magnificent objects in the animal kingdom. A further distinction between the Lion and other Cats is to be found in the strong tuft of hair at the end of the tail, which exists in both sexes. Quite at the extremity of the tail, and hidden by the tuft, is a curious little horny appendage or "thorn," with which it was supposed that the Lion, when lashing his tail, spurred his flanks, and so awoke all his courage and ferocity!

We have just mentioned the uniform tawny colour as characteristic of the Lion. This is so, in fact, in adult specimens, but the new-born young are invariably spotted, and the spots often persist for a considerable time. This is the case with Lions born in captivity, as well as with those in a state of nature, and has often been observed in the Lions born in the Zoological Gardens. In some instances the spots are visible during the animal's life. There are grounds for believing that all the great Cats are descended from a spotted ancestor.

One more external character: the snout of the Lion is longer and more Dog-like than that of any other Cat; the forehead and nose are almost in the same straight line, instead of making a bold curve, as they do in the Tiger, Leopard, Jaguar, and the smaller Cats. So that the Lion, which is

conventionally represented with an almost human roundness of face, has really a more thoroughly quadrupedal "muzzle" than any of his kin.

In the Cape Lion the tail tuft is black, the mane brown or black, according to age, and the handsome appearance of the animal is thus much enhanced. There is also a black spot at each corner of the mouth.

The size varies slightly in the different varieties. Captain Harris gives the measurements of an adult male from the Cape as follows:—Extreme length from snout to tip of tail, usually about ten feet; tail, three feet; height at the shoulder, three feet eight inches. The "maneless" Lion is somewhat smaller, as shown by the following measurements made by Captain Smee:—Length, including the tail, eight feet nine inches and a half; height (at the shoulder, we suppose), three feet six inches; and the impression of his paw measured six inches and a half across. A female, killed at the same time, was eight feet seven inches long, and three feet four inches high. The weight of the male (excluding the entrails) was thirty-five stone.

The *real size* of the Lion is much less than would be supposed before measurement; and he is very inferior in size to many kinds of the Herbivorous animals, such as Horses, Oxen, and Buffaloes, and even the larger Antelopes, such as the Eland.

As to the internal structure of the Lion, there is really nothing, or almost nothing, to add to what has already been said under the character of the whole family. Like all the great beasts of prey, the Tiger, Leopard, &c., the osseous and muscular systems are immensely developed. The ridges of the bones take on a marvellous size for the attachment of the muscles, and in the skull the size of the great processes to which the muscles of the neck are attached, and the width of the jugal arches, or bony bridges under which pass the great muscles by which the lower jaw is closed, and the powerful bite given, are very remarkable.

It is curious to see what wonderfully different impressions are produced on different writers by the appearance of the Lion in his native haunts. For instance, Captain Harris says, "Those who have seen the monarch of the forest in crippling captivity only, immured in a cage barely double his own length, with his sinews relaxed by confinement, have seen but the shadow of that animal which 'clears the desert with his rolling eye.'"

On the other hand, Livingstone speaks in the most disrespectful, not to say contemptuous way, of the animal's vaunted majesty of bearing: "When a Lion is met in the daytime, a circumstance by no means unfrequent to travellers in these parts, if pre-conceived notions do not lead them to expect something very 'noble' or 'majestic,' they will see merely an animal somewhat larger than the biggest Dog they ever saw, and partaking very strongly of the canine features. The face is not much like the usual drawings of a Lion, the nose being prolonged like a Dog's; not exactly such as our painters make it, though they might learn better at the Zoological Gardens; their ideas of majesty being usually shown by making their Lions' faces like old women in nightcaps. When encountered in the daytime, the Lion stands a second or two gazing, then turns slowly round, and walks as slowly away for a dozen paces, looking over his shoulder; then begins to trot, and, when he thinks himself out of sight, bounds off like a Greyhound."

The concluding sentence of this passage shows that Livingstone considers not only the Lion's beauty to have been over-rated, but his courage also. The following extract quite bears out this opinion:—

"On riding briskly along early one morning, I observed, as I thought, a solitary Zebra a few hundred yards in advance. I instantly alighted, and, leaving 'Spring' (his horse) to take care of himself, I made towards the quarry, gun in hand, under cover of a few small trees. Having proceeded for some distance, I peeped cautiously from behind a bush, when I found, to my astonishment, that the animal which I had taken for a Zebra was nothing less than a noble Lion. He was quietly gazing at me. I must confess I felt a little startled at the unexpected apparition; but, recovering quickly from my surprise, I advanced to meet him. He, however, did not think fit to wait till I was within proper range, but turned tail, and fled towards the Swakess. Hoping to be able to come to close quarters with him, I followed at the top of my speed, and was rapidly gaining ground on the brute, when suddenly, with two or three immense bounds, he cleared an open space, and was the next moment hidden from view among the thick reeds that here lined the banks of the river. Having no

Dogs with me, all my efforts to dislodge him from his stronghold proved unavailing. Whilst still lingering about the place, I came upon the carcase of a Gnu, on which a troop of Lions had, apparently, been feasting not many minutes previously. Undoubtedly my somewhat dastardly friend had been one of the party."

After such rude shocks as these to our faith in the African monarch's courage, it is positively refreshing to come across instances where the Lion has shown himself capable of very great boldness, such, for instance, as the following :—

"We were waked up suddenly by hearing one of the Oxen bellowing and the Dogs barking. It

LION AND LIONESS ATTACKING AN ELEPHANT.

was moderately dark, and I seized Clifton's double rifle, and rushed out, not knowing where, when I saw the driver perched on the top of a temporary hut, made of grass, about six feet high, roaring lustily for a doppè (cap). I scrambled up just as the poor Ox ceased his cries, and heard the Lions growling and roaring on the top of him, not more than fourteen yards from where we were, but it was too dark to see them. I fired, however, in the direction of the sound, and just above the body of the Ox, which I could distinguish tolerably well, as it was a black one. Diza (the driver) followed my example ; and, as the Lions did not take the least notice, I fired my second barrel, and was just proceeding to load my own gun, which Jack had brought me, when I was aware, for a single instant only, that the Lion was coming ; and the same moment I was knocked half-a-dozen somersaults backwards off the hut, the brute striking me in the chest with his head. I gathered myself up in a second, and made a dash at a fence just behind me, and scrambled through it, gun in hand, but the muzzle was

choked with dirt. I then made for the wagon, and got on the box, where I found all the Kaffirs, who could not get inside, sticking like Monkeys, and Diza perched on the top. How he got there seemed to me a miracle, as he was alongside me when the brute charged. A minute or two afterwards one of them marched off a Goat, one of five that were tethered by the foot to the hut that we had so speedily evacuated.

"Diza, thinking he had a chance, fired from the top of the wagon, and the recoil knocked him backwards on to the tent, which broke his fall. It was a most ludicrous sight altogether. After that we were utterly defeated, and the brutes were allowed to eat their meal unmolested, which they continued to do for some time, growling fiercely all the while. The Kaffirs said there were five in all. I fired once again, but without effect; and we all sat shivering with cold without any clothes on till near daybreak, when our enemies beat a retreat, and I was not sorry to turn in again between the blankets. I was just beginning to get warm again when I was aroused by a double shot, and rushed out on hearing that the driver and after-rider had shot the Lion. We went to the spot, and found a fine Lioness dead, with a bullet through the ribs from the after-rider; a good shot, as she was at least 150 yards off. Another had entered the neck just behind the head, and travelled all along the spine nearly to the root of the tail. I claimed the shot, and forthwith proceeded to skin her. I cut out the ball; it proved to be my shot out of Clifton's rifle. This accounted for her ferocious onslaught. The after-rider was rather chopfallen at having to give her up to the rightful owner.

"Diza got a claw in his thigh, and the gun which he had in his hand was frightfully scratched on the stock: rather sharp practice. A strong-nerved old Kaffir woman lay in the hut the whole time, without a door or anything whatever between her and the Lions, and kept as still as a Mouse all the while."

Again:—"The enemy disdainfully surveyed us for several minutes, daring us to approach with an air of conscious power and pride, which well beseemed his grizzled form. As the rifle balls struck the ground nearer and nearer at each discharge, his wrath, as indicated by his glistening eyes, increased roar, and impatient switching of the tail, was clearly getting the mastery over his prudence. Presently a shot broke his leg. Down he came upon the other three with reckless impetuosity, his tail straight out and whirling on its axis, his mane bristling on end, and his eyeballs flashing rage and vengeance. Unable, however, to overtake our Horses, he shortly retreated under a heavy fire, limping and discomfited to his stronghold. Again we bombarded him, and again exasperated he rushed into the plain with headlong fury, the blood now streaming from his open jaws, and dyeing his mane with crimson. It was a gallant charge, but it was to be his last. A well-directed shot arresting him in full career he pitched with violence upon his skull, and throwing a complete somersault, subsided amid a cloud of dust."

The Lion has some excuse for occasionally developing a strong running away propensity. His pace when going at full speed is wonderfully rapid, considering the length of his legs. As the following extract shows, he is able to outrun a firstrate Horse, so that the animals on which he usually feeds would, if he chose to pursue them, have simply no chance whatever against him. As we shall see, however, the Lion seldom pursues his prey, preferring to lie in ambush and to spring upon a passing herd. This consideration makes the following experience rather remarkable. The Lion probably pursued Mr. Baldwin not to satisfy appetite, but for revenge.

"Now for an adventure with a Lion, which I have reserved for the last. On Friday the old Masara captain paid me a visit. He had seen a Lion in the path, and left a lot of Masaras to watch him. I had been working hard all day in the hot sun with an adze, making a dissel-boom for the wagon, and was tired, lame, and shaky in the arms, and did not feel at all up to the mark for rifle-shooting; but I ordered 'Ferns' to be saddled, who was also not at all fresh, having had a tremendous burst in the morning across a flat after a lean Eland Cow. Just after, I caught sight of about twenty-five Masaras sitting down, all armed to the teeth with shields and assegais. My attention was attracted to a Kaffir skull, which struck me as a bad omen, and the thought entered my head that it might be my fate to lay mine to bleach there. I did not, however, suffer this thought to unnerve me, but proceeded, and found that the Lion had decamped. The Masaras followed his spoor about a couple of miles, when he broke cover. I did not see him at first, but gave chase in the direction in which the Masaras pointed, saw him, and followed for about 1,000 yards, as he had a long start, when

he stood in a nasty thorn thicket. I dismounted at about sixty or seventy yards, and shot at him. I could only see his outline, and that very indistinctly, and he dropped so instantaneously that I thought I had shot him dead. I remounted and reloaded, and took a short circle, and stood up in my stirrup to catch a sight of him. His eyes glared so savagely, and he lay crouched in so natural a position, with his ears alone erect, the points black as night, that I saw in a moment I had missed him. I was then about eighty yards from him, and was weighing the chances of getting a shot at him from behind an immense ant-heap, about fifty yards nearer. I had just put the Horse in motion with that intention when on he came with a tremendous roar, and 'Ferns' whipped round like a top, and away at full speed. My Horse is a fast one, and has run down the Gemsbok, one of the fleetest Antelopes, but the way the Lion ran him in was terrific. In an instant I was at my best pace, leaning forward, rowels deep into my Horse's flanks, looking back over my left shoulder over a hard, flat, excellent galloping ground. On came the Lion, two strides to my one. I never saw anything like it, and never want to do so again. To turn in the saddle and shoot darted across my mind when he was within three strides of me, but on second thoughts I gave a violent jerk on the near rein, and a savage dig at the same time with the off-heel, armed with a desperate rowel, just in the nick of time, as the old manikin bounded by me, grazing my right shoulder with his, and all but unhorsing me, but I managed to right myself by clinging to the near stirrup-leather. He immediately slackened his speed. As soon as I could pull up, which was not all at once, as 'Ferns' had his mettle up, I jumped off, and made a very pretty and praiseworthy shot, considering the fierce ordeal I had just passed (though I say it who ought not), breaking his hind leg at 150 yards off, just at the edge of the thicket. Fearful of losing him, as the Masaras were still flying for bare life over the veldt, with their shields over their heads, and I knew nothing would prevail on them to take the spoor again, I was in the saddle, and chasing him like mad in an instant. His broken leg gave me great confidence, though he went hard on three legs; and I jumped off forty yards behind him, and gave him the second barrel—a good shot—just above the root of the tail, breaking his spine, when he lay under a bush roaring furiously, and I gave him two in the chest before he cried 'Enough!' He was an old manikin, fat and furious, having only four huge yellow blunt fangs left."

Not only has the Lion the advantage of great courage—at least, except when coming in contact with those he feels to be his masters—and of great swiftness, but his strength is prodigious. He will fell an Ox or an Antelope with a single blow of his paw, break its neck with one crunch of his cruel teeth, and bound off with it to his lair as easily as if he were only carrying a Rabbit. With a Calf in his mouth he has been known to leap a wall nine feet high. Not an animal of the forest, save the Rhinoceros, can hope to escape from such terrible perfections as these. Any quarry the Lion may choose—Ox, Antelope, or Zebra—is bound to succumb.

There is another characteristic about the beast which is a valuable accessory weapon, comparable to the "British cheer," with which our soldiers are always supposed to strike terror into the hearts of their enemies. We mean, of course, the terrible roar—that deafening thunder voice, at sound of which the Leopard and Hyæna hold their breath in awe, and the doomed flocks tremble and flee. With man even the noise, when heard for the first time, produces an indescribable feeling, and a firm conviction that all his courage will be needed to meet such a fearful opponent. Sometimes, however, the Lion seems to exercise his voice for fun, or for practice, rather than for striking terror into his hearers.

The terror in which the Lion is held by the meaner members of his own family is well shown by the following passage from Homer. Menelaus and Ajax hear Ulysses calling for help:—

> "——— at the voice arrived, they found
> Ulysses, Jove-beloved, compass'd about
> By Trojans, as the Lynxes in the hills,
> Athirst for blood, compass an antler'd Stag
> Pierced by an archer; while the blood is warm
> And his limbs pliable, from him he 'scapes:
> But when the feather'd barb hath quell'd his force,
> In some dark hollow of the mountain's side,
> The hungry troop devour him; chance, the while,
> Conducts a Lion thither, before whom

All vanish, and the Lion feeds alone;
So swarm'd the Trojan powers numerous and bold,
Around Ulysses, who with wary skill
Heroic combated his evil day.
But Ajax came, covered with his broad shield
That seemed a tower, and at Ulysses' side
Stood fast; then fled the Trojans wide-dispersed."

Shakspere has the same idea, when he says—

"Lions make Leopards tame."

The magnanimity of the Lion is a very well-worn theme. Every one knows all about Androcles and the Lion; "the tale is somewhat musty" by this time. All the older poets have something about it—the writers of the golden age—before natural selection was thought of, and when animals of many kinds were credited with a vast amount of idyllic amiability, of which, alas! nobody believes them capable now.

In the exquisite woodland scenery of "As You Like It," a hungry Lioness that has just suckled her whelps, is accredited with a nobility to which she, assuredly, had no title. "A green and gilded Snake" has been frightened from the sleeping Oliver by Orlando—

"——— it unlinked itself,
And with indented glides did slip away
Into a bush; under which bush's shade
A Lioness, with udders all drawn dry,
Lay couching, head on ground, with Cat-like watch,
When that the sleeping man should stir, for 'tis
The royal disposition of that beast
To prey on nothing that doth seem as dead."

We are not anxious to know when and how Shakspere gained his knowledge of wild beasts; we possess his descriptions, and that suffices for us. He may make Athenians speak like his fellow Englishmen; place Bohemia by the sea-side, and have the forest of Arden peopled with Lions. All that is of the least importance; for, may we not say of him, what he makes Helena say to Hermia?—

"——— your tongue's sweet air,
[Is] More tuneable than Lark to shepherd's ear,
When wheat is green, when hawthorn buds appear."

The Lion is a solitary animal, hunting alone, except from the commencement of the breeding season, when his wife goes with him, up to the time when the babies are beginning to know how to take care of themselves. Until they have arrived at months of discretion, "the Lion tears in pieces enough for his whelps and strangles for his Lionesses, and fills his holes with prey and his dens with ravine."

The Lion's den is made by scraping away the surface of the earth in some secluded spot, where the beast remains as long as game is plentiful, and there is no one to disturb him. When he has used up one hunting-ground, he departs for "fresh woods and pastures new."

He hunts entirely by night, at which time it is not safe for any one, in a Lion neighbourhood, to stir out without firearms, for the Lion, with the laziness which distinguishes him, will always prefer man-meat caught at once, to Antelope or Zebra-meat, for which he will have the trouble of looking. In the daytime he spends most of the time in sleeping off his bloody carouse, and, until nightfall, is always very unwilling to be disturbed, and unless molested hardly at all dangerous, except in the breeding season. This seems curious, as, from the ferocity of the animal when he is attacked, or when he is catering for himself by night, it savours of the marvellous to talk of such a savage being harmless under any circumstances. But there can be no doubt about the fact; he seems to object to expose his actions not only to the light of day, but also to that of the moon. For this, we have the testimony of a

man whose loss Englishmen have not yet ceased to deplore; a man who, by universal consent, is *facile princeps* in the ranks of African explorers:—

"By day ther is not, as a rule, the smallest danger of Lions which are not molested attacking man, nor even on a clear moonlight night, except they possess a breeding στοργή (natural affection). This makes them brave almost any danger. And, if a man happens to cross to the windward of them, both Lion and Lioness will rush at him, in the manner of a bitch with whelps. This does not often happen, as I only became aware of two or three instances of it. In one case a man, passing when the wind blew from him to the animals, was bitten before he could climb a tree. And, occasionally, a man on horseback has been caught by the leg under the same circumstances. So general, however, is the sense of security, on moonlight nights, that we seldom tied up our Oxen, but let them lie loose by the wagons. While, on a dark, rainy night, if a Lion is in the neighbourhood, he is almost sure to venture to kill an Ox."*

The following passage shows how unusual it is for a Lion to do any damage by day; so uncommon that the natives consider a supernatural cause necessary to account for so remarkable an occurrence:—

"The Bakâtla of the village Mabatsa were much troubled by Lions, which leaped into the cattle-pens by night, and destroyed their Cows. They even attacked the herds in open day. This was so unusual an occurrence that the people believed that they were bewitched: 'given,' as they said, 'into the power of the Lions by a neighbouring tribe.' They went once to attack the animals, but, being rather a cowardly people compared to Bechuanas in general, on such occasions, they returned without killing any."

The darker and stormier the night is the better the Lions like it, and the more persistent will be their attacks. "The new moon brought, if possible, a more abundant supply of rain than usual; nor did the Lions fail to take advantage of the nocturnal tempest, having twice endeavoured to effect an entrance into the cattle-fold. It continued, until nine o'clock the next morning, to pour with such violence, that we were unable to open the canvas curtains of the wagon. Peeping out, however, to ascertain if there was any prospect of its clearing up, we perceived three Lions squatted within a hundred yards, in open plain, attentively watching the Oxen. Our rifles were hastily seized, but the dampness of the atmosphere prevented their exploding. One after another, too, the Hottentots sprang out of the pack-wagons and snapped their guns at the unwelcome intruders, as they trotted sulkily away, and took up their position on a stony eminence at no great distance. Fresh caps and priming were applied, and a broadside was followed by the instantaneous demise of the largest, whose cranium was perforated by two bullets at the same instant. Swinging their tails over their backs, the survivors took warning by the fate of their companion, and dashed into the thicket with a roar."

When a Lion is fortunate enough to live in the neighbourhood of villages, he naturally prefers the least troublesome course of selecting his supper from the flocks and herds of the inhabitants. It is said that in Algeria, some thirty years ago, each Lion, in the course of his life, cost the Arabs upwards of £8,400, as he destroys every year Cattle, Horses, Camels, &c., to the value of £240, and the average duration of a Lion's life may be taken at thirty-five years. Thus, Jules Gérard, the celebrated Lion-killer, remarks, that in one district the Arab who paid five francs a-year to the State, paid fifty to the Lion!

If there are no farms or villages handy, the Lion has to content himself with the more troublesome course of catching wild prey. To this end he lies in ambush, in some convenient spot, and waits patiently or impatiently until a herd of Antelopes or Zebras passes by, when he leaps upon one of the number, roaring terribly. He usually strikes the animal down at once, by the immense weight of his body, the terrible blow of his paw, and the fearful grip of his teeth in the neck of his victim. If he misses his aim, he never pursues the flying herd, but returns dejectedly to his lair and waits for another opportunity. The Lion's mode of attack is described with all the marvellous accuracy and fire of his transcendent genius by the great Grecian:—

"—— —— as leaps a famish'd Lion fell
On beeves that graze some marshy meadow's breadth

* Livingstone.

A countless herd, tended by one unskill'd
To cope with savage beasts in their defence,
Beside the foremost kine or with the last
He paces heedless, but the Lion, borne
Impetuous on the hindmost, one devours
And scatters all the rest."

"But as the Lion on the mountains bred,
Glorious in strength, when he hath seized the best
And fairest of the herd, with savage fangs
First breaks her neck, then laps the bloody paunch
Torn wide. Meantime, around him, but remote,
Dogs stand and swains clamouring, yet by fear
Repress'd, annoy him not or dare approach."

The Lion is said sometimes to develop the taste for "man-eating," which makes the Tiger so terrible. This, however, is comparatively rare, except in old animals; but, whether he eats men by choice or not his depredations are fearfully extensive, especially when he has had a good deal of experience, knows exactly when to attack a place, and has lost wholly or in part the fear of man, which usually distinguishes him. Here is an account of the termination of the career of one of these heroes, a perfect Dick Turpin among Lions, so great had become his skill in "lifting":—

"We had not been many days at that place, when a magnificent Lion suddenly appeared one night in the midst of a village. A small Dog that had incautiously approached the beast paid the penalty of its life for its daring. The next day a grand chase was got up, but the Lion, being on his guard, managed to elude his pursuers. The second day, however, he was killed by Messrs. Galton and Bam; and, on cutting him up, the poor Dog was found, still undigested, in his stomach, bitten into five pieces. The natives highly rejoiced at the successful termination of the hunt; for this Lion had proved himself to be one of the most daring and destructive ever known, having, in a short time, killed upwards of fifty Oxen, Cows, and Horses. When he had previously been chased he had always escaped unscathed, and every successive attack made upon him only served to increase his ferocity."

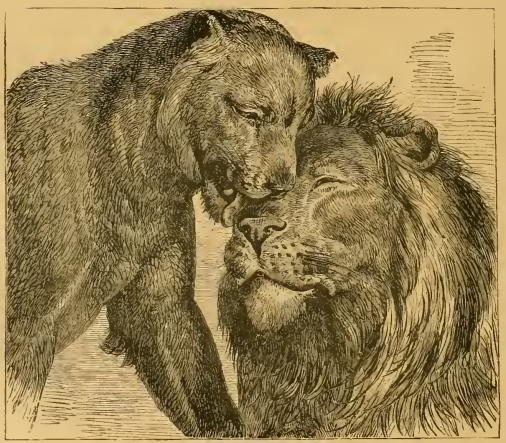
That the Lion does not always "drink the blood of the slain," but adopts a mild and cooling diet at times, is shown by a remarkable passage in Dr. Livingstone's work. He is speaking of the various vegetable blessings in the desert:—"But the most surprising plant of the desert is the 'Kengwe or Kéme' (*Cucumis caffer*), the water melon. In years when more than the usual quantity of rain falls, vast tracts of the country are literally covered with these melons. This was the case annually when the fall of rain was greater than it is now, and the Bakwains sent trading parties every year to the Lake. It happens commonly once every ten or eleven years. For the last three years its occurrence has coincided with an extraordinarily wet season. Then animals of every sort and name, including man, rejoice in the rich supply. The Elephant, true lord of the forest, revels in this fruit, and so do the different species of Rhinoceros, although naturally so diverse in their choice of pasture. The various kinds of Antelopes feed on them with equal avidity; and Lions, Hyænas, Jackals, and Mice, all seem to know and appreciate the common blessing."

This is a very curious circumstance when we consider how purely carnivorous the Lion, in common with the other *Felidæ*, is under ordinary circumstances. But Dr. Livingstone's is not the only evidence to show that the bloodthirsty creature occasionally likes a "relish" of green-meat with its flesh. We are informed by Dr. Huggins, F.R.S., that in the Zoological Gardens at Dublin a Lioness had had several litters, but the young ones invariably languished and died after a short time, until the expedient was hit upon of supplying the Lioness with live Goats. This seems horrible enough, but in fact it was not so. The Goat was put into the cage in the evening, and instead of manifesting the extreme terror one would have expected, it seemed to feel no fear at all, but ate grass placed in the den with perfect content, and, when night came, and it had eaten its fill, lay down by its terrible companion, cuddling up close to her, chewing the cud, and seeming to enjoy the warmth, and to be delighted with its new bedfellow. The Lioness showed no hostility to the confiding beast until towards the morning, when she suddenly smashed its head with one blow of her paw, ripped it open,

and at once began feeding with avidity on the paunch, with its contents of softened and half-digested grass, always completely finishing this "herbaceous treat" before setting to work on the flesh. It is also stated (*vide infra*) that very old Lions take to eating grass, thus giving a literal significance to the favourite "Lion and Lamb" illustration, used by poets of all ages to express the change by which the "natural man" is converted into the "spiritual man," the savage civilised, and the "Philistine" cultured—"The Lion shall eat straw like the Ox."

"And now beside thee, bleating Lamb,
I can lie down and sleep,
Or think on Him who bore thy name,
Graze after thee and weep."

The Lion enjoys the honourable distinction of being, unlike most Carnivora, strictly faithful to his spouse, although report says that she is by no means so virtuous, but only cleaves to her mate until a stronger and handsomer one turns up. Let us hope this is a calumny. At the breeding season each Lioness is usually followed by a number of Lions, who try all means in their power to gain her affections, and fight the most terrible battles with one another. In these fights the mane is of great use, for its length and thickness prevent the combatants taking a firm grip of one another's neck. Thus, the Lion with the finest mane has the best chance of succeeding in life in two ways. The Lioness is more likely to take a fancy to him than to a less favoured suitor, for most of the lower animals, as well as ourselves, appreciate personal adornment very strongly: and he has also the best possible protection in the tournament in which he is obliged to take part, fighting, *à outrance*, against all comers.



THE KISS OF PEACE.

When the battle is over, and the "queen of love and beauty" has bestowed the prize—herself—on the victor, the happy pair live together until the young are able to take care of themselves. The male often hunts for his mate, and allows her to take as much as she wants of the prey before satisfying his own hunger. He cares for her in the same way all the time she is suckling, and for the litter from the time when they are weaned till they are able to hunt for themselves.

The Lioness goes with young about fifteen or sixteen weeks, and produces from two to six at a litter. The cubs are delightful little creatures, about as big as a moderate-sized Cat, blind at first, with pretty, innocent faces, and delightfully playful ways. The mother is devoted to them; thinks, no doubt, like Celia Chettam, in "Middlemarch," that where there are babies "things are right enough, and that error, in general, is a mere lack of that central posing force."

When the cubs are about eight to twelve months old they begin hunting for themselves, by attacking smaller animals, such as Sheep and Goats, under their parents' direction. The period between the ages of one and two years is the worst part of the Lion's existence, as far as the inhabitants of the district are concerned, for they "kill not only to support themselves, but also in order to learn how to kill."

At the age of three the young Lion's education is complete; he leaves his father's house, and begins to think of getting a house and a wife for himself, and then in her company he "roars after his prey and seeks his meat from God" for the rest of his career. He is not full-grown until the age of eight, when he may be considered as quite adult; and for many years to come revels in the consciousness of unconquerable strength and power, and oppresses all inferior creatures to his heart's content.

But even to king Leo "life is not all beer and skittles;" there is suffering and work to be borne and done. The lower creatures "groan and travail" with us; and we find disease where we should least expect to find it, namely, in the wild creatures that at their will freely roam the desert. "The Carnivora, too, become diseased and mangy. Lions become lean, and perish miserably by reason of the decay of the teeth. When a Lion becomes too old to catch game, he frequently takes to killing Goats in the villages. A woman or child happening to go out at night falls a prey too; and as this is his only source of subsistence now, he continues it. From this circumstance has arisen the idea that the Lion, when he has once tasted human flesh, loves it better than any other. A man-eater is, invariably, an old Lion. And, when he overcomes his fear of man so far as to come to villages for Goats, the people remark, 'His teeth are worn, he will soon kill men.' They at once acknowledge the necessity of instant action, and turn out to kill him. When living far away from population, or when, as is the case in some parts, he entertains a wholesome dread of the Bushmen and Bakalahari, as soon as either disease or old age overtakes him, he begins to catch Mice and other small Rodents, and even to eat grass. The natives, observing undigested vegetable matter in his droppings, follow up his trail in the certainty of finding him, scarcely able to move, under some tree, and despatch him without difficulty. The grass may have been eaten as medicine, as is observed in Dogs."

Before leaving the subject of the life and death of our great Carnivore, it will be as well to add a few words as to its breeding in captivity. It is stated by a naturalist who probably knows more about the matter than any other man,* that "the Lion appears to breed more freely than any other species of *Felis*, and the number of young at a birth is greater, not unfrequently four, and sometimes five, being produced in a litter. It is remarkable that these animals breed more freely in travelling collections (wild-beast shows) than in zoological gardens. Probably the constant excitement and irritation produced by moving from place to place, or change of air, may have considerable influence in the matter.

"A very extraordinary malformation, or defect, has frequently occurred among the Lions produced during the last thirty years, in the Regent's Park. This imperfection consists in the roof of the mouth being open. The palatal bones do not meet: the animal, is, therefore, unable to suck, and consequently always dies. This abnormal condition has not been confined to the young of any one pair of Lions, but many Lions that have died in the Zoological Gardens, and not in any way related to each other, have, from time to time, produced these malformed young, the cause of which appears to me quite unaccountable."

Lion-hunting has not yet become, like Tiger-hunting, a regularly organised sport, entered upon at a particular season by large parties of Europeans, who think far more of the fun of the thing than of ridding the world of destroying beasts. The sport of Lion-hunting, on the other hand, is only undertaken by an individual traveller, now and then, who has to take nearly the whole of the danger on his own shoulders, and is quite without the extraneous aids afforded by regiments of Elephant-mounted fellow-hunters, and armies of beaters. The rest of the Lion-killing is done, not for sport, but for use, to get rid of a beast which has decimated flocks, and put friends and neighbours to a cruel death. In all parts where the Lion is found, the natives have one or more ways of trying to get rid of him: sometimes meeting him in open fight, sometimes destroying him in a more underhand manner, by pitfalls, or the like.

* Mr. Bartlett, the able Superintendent of the Zoological Gardens.

Of all methods, that which is attended with the least danger is the ditch, or pitfall, of the Arabs of Algeria. This is a pit four or five yards broad, and ten deep, dug in the middle of the *douar*, or small encampment of from ten to twenty tents, in which the Arabs live during the winter. The whole douar is surrounded by a hedge, two or three yards in height, and a lesser hedge is placed round the pit to prevent the cattle falling into it; the latter being kept loose within the encampment to attract Lions by their scent and their cries. When the desirable effect is attained, and a Lion has made up his mind to take toll from the flock he hears bleating within the enclosure, he leaps the hedge with one of his tremendous bounds, and, the ditch being a less distance from the hedge than the horizontal range of his leap, falls headlong into the trap prepared for him, from which, owing to its depth, and the fact that it is made narrower above than below, his most frantic efforts can never succeed in extricating him.

As soon as the Arabs hear his roars, and know that they have their enemy a prisoner, they prepare a great feast, summon all the inhabitants of the neighbouring douars, and, proceeding to the pit's mouth, every one hurls stones at the poor animal, calling him at the same time by all the opprobrious names in the Arabic vocabulary, and, finally, fire upon him until he is dead. When this is the case, they haul up the carcase with ropes; and, having got their prey on level ground, "the mothers take each a small piece of the animal's heart and give it to their male children to eat, in order to render them strong and courageous. They take away as much as possible of the mane in order to make amulets of it, which are supposed to have the same effect. Then, when the skin has been removed and the flesh divided, each family goes back to its respective douar, where, in the evening, beneath the tents, the event of the day will, for a long time, be the favourite story with every one."

Besides the pitfall, the Arabs construct ambushes, which are of two kinds. "In the first a hole is dug, about a yard deep, and three or four wide. After placing trunks of trees over it, and covering them with heavy stones, the whole is strewed over with the earth dug out of the ground, except in a few places on one side, where holes are left for the men to shoot through, and an opening on the other, which forms the door of the cavern, and which is closed from the inside by means of a piece of rock." A pit of this sort is made in some place frequented by Lions. The carcase of an animal is put on the ground opposite the loopholes, and the Arabs get inside and wait until the Lion begins to try conclusions with the bait, when he is promptly peppered by his hidden enemies.

In the second kind of ambush, the hunters conceal themselves in a tree instead of in a pit. Otherwise the mode of procedure is the same.

All these methods of Lion-slaying are safe and sure, but scarcely heroic. Often, however, the Arabs organise regular hunting parties, and compass the death of their foe in a far more legitimate and sportsman-like manner. A party of about fifty usually take part in the hunt; they proceed, after a good deal of talking over the plan of operations, to the Lion's lair, and by the foot-marks it is determined whether the animal in question is young or old, male or female. Five or six experienced Arabs act as watchmen to observe the movements of the game, and signal to their comrades. The *modus operandi* varies with the age and sex of the Lion. Jules Gérard describes the method when a full-grown male, of course the worst of all to have to do with, is diagnosed.

"When the hunters have succeeded in getting within gunshot of the supposed lair, they 'turn' it, so as to command it from the high ground, and stop directly they command the position, observing throughout their operations the greatest silence. As the Lion's sense of hearing is very delicate, it sometimes happens that he hears the steps of the hunters, or the rolling of some stone which has been displaced from the side of the mountain. In this case he rises and walks in the direction of the sound. If one of the 'men of the watch' perceive him, he takes the skirt of his burnous in his right hand, and hoists it before him, which means 'I see him.' One of the huntsmen from the group then stands forward, and puts himself in communication with him, shaking his burnous from right to left, which signifies 'Where is he?' and 'What is he doing?' If the Lion is still, the 'man of the watch' raises the skirts of his burnous to his head, then lets them fall, and walks a few steps forwards, repeating the same signal, which may be translated by 'He is motionless, in front of you, and at some distance.' If the Lion walks to the right or left, the man walks in the same

direction, shaking his burnous either from left to right, or from right to left. Finally, if the animal proceeds in the direction of the hunters, the 'man of the watch' places himself exactly opposite them, shakes his burnous violently, and cries with all his might, '*Aou likoum!*' ('Take care!') At this signal the hunters draw themselves up in a line, if possible against a rock, so that their position may not be turned. Woe to him who has not heard the cry of '*Aou likoum!*' in sufficient time, and has stopped at some distance from his comrades."

When a Lion actually comes in sight, all concealment is, of course, at an end. The Arabs get as near as possible, to fire, and as soon as their guns are discharged rush upon the wounded beast with their pistols and swords. As might naturally be expected the casualties in this mode of warfare are fearful; hardly a hunt takes place unmarked by the death of one or more of the hunters.

One of the most daring single combats of which we ever remember to have read was one between a great black-maned Lion and Mr. C. J. Andersson, who had all the real part of the fight entirely to himself. The account is also interesting as showing—like, perhaps, most descriptions of the same kind—how very tenacious of life the Lion is, for the animal in question, although it had received the contents of both Mr. Andersson's barrels, one of which completely smashed its shoulder, had a sufficient number of its nine lives left to enable it to get clear off, and cheat its gallant destroyer of his lawful spoil—the skin.

"One day, when eating my humble dinner, I was interrupted by the arrival of several natives, who, in breathless haste, related that an *Ongeama*, or Lion, had just killed one of their Goats close to the mission station (Richterfeldt), and begged of me to lend them a hand in destroying the beast. They had so often cried 'Wolf!' that I did not give much heed to their statements; but, as they persisted in their story, I at last determined to ascertain its truth. Having strapped to my waist a shooting-belt containing the several requisites of a hunter—such as bullets, caps, knife, &c.—I shouldered my trusty double-barrelled gun (after loading it with steel-pointed balls), and followed the men.

"In a short time we reached the spot where the Lion was believed to have taken refuge. This was in a dense tamarisk brake of some considerable extent, situated partially on and below the sloping banks of the Swakop, near to its junction with the Omutenna, one of its tributaries.

"On the rising ground above the brake in question were drawn up in battle array a number of Damaras and Namaquas, some armed with assegais, and a few with guns. Others of the party were in the brake itself, endeavouring to oust the Lion.

"But as it seemed to me that the 'beaters' were timid, and moreover somewhat slow in their movements, I called them back, and, accompanied by only one or two persons, as also a few worthless Dogs, entered the brake myself. It was rather a dangerous proceeding, for in places the cover was so thick and tangled as to oblige me to creep on my hands and knees, and the Lion in consequence might easily have pounced upon me without a moment's warning. At that time, however, I had not obtained any experimental knowledge of the old saying, 'A burnt child dreads the fire,' and therefore felt little or no apprehension.

"Thus I had proceeded for some time when suddenly, and within a few paces of where I stood, I heard a low, angry growl, which caused the Dogs, with hair erect in the manner of Hogs' bristles, and with their tails between their legs, to slink behind my heels. Immediately afterwards, a tremendous shout of 'Ongeama, Ongeama!' was raised by the natives on the bank above, followed by a discharge of firearms. Presently, however, all was still again, for the Lion, as I subsequently learnt, after showing himself on the outskirts of the brake, had retreated into it.

"Once more I attempted to dislodge the beast; but finding the enemy awaiting him in the more open country, he was very loth to leave his stronghold. Again, however, I succeeded in driving him to the edge of the brake, where, as in the first instance, he was received with a volley; but a broomstick would have been equally efficacious as a gun in the hands of these people, for, out of a great number of shots that were fired, not one seemed to have taken effect.

"Worn out at length by my exertions, and disgusted beyond measure at the way in which the natives bungled the affair, I left the tamarisk brake, and, rejoining them on the bank above, offered to change places with them. But my proposal, as I expected, was forthwith declined.

"As the day, however, was now fast drawing to a close, I determined to make one other effort

to destroy the Lion, and should that prove unsuccessful, to give up the chase. Accordingly, accompanied by only a single native, I again entered the brake in question, which I examined for some time without seeing anything; but on arriving at that part of the cover we had at first searched, and when in a spot comparatively free from bushes, up suddenly sprang the beast within a few paces of me. It was a black-maned Lion, and one of the largest I ever remember to have encountered in Africa. But his movements were so rapid, so silent, and smooth withal, that it was not until he had partially entered the thick cover (at which time he might have been about thirty paces distant) that I could fire. On receiving the ball he wheeled short about, and with a terrific roar, bounded towards me. When within a few paces he crouched as if about to spring, having his head embedded, so to say, between his fore-paws.

"Drawing a large hunting-knife, and slipping it over the wrist of my right hand, I dropped on one knee, and, thus prepared, awaited his onset. It was an awful moment of suspense, and my situation was critical in the extreme. Still my presence of mind never for a moment forsook me—indeed, I felt that nothing but the most perfect coolness and absolute self-command would be of any avail.

"I would now have become the assailant; but as—owing to the intervening bushes, and clouds of dust raised by the Lion's lashing his tail against the ground—I was unable to see his head, while to aim at any other part would have been madness, I refrained from firing. Whilst intently watching his every motion, he suddenly bounded towards me; but whether it was owing to his not perceiving me—partially concealed as I was in the long grass—or to my instinctively throwing my body on one side, or to his mis-calculating the distance in making his last spring, he went clear over me, and alighted on the ground three or four paces beyond. Instantly, and without rising, I wheeled round on my knee, and discharged my second barrel, and as his broadside was then towards me, lodged a ball in his shoulder, which it completely smashed. On receiving my second fire he made another and more determined rush at me; but owing to his disabled state, I happily avoided him. It was, however, only by a hair's breadth, for he passed me within arm's length. He afterwards scrambled into the thick cover beyond, where, as night was then approaching, I did not deem it prudent to pursue him.

"At an early hour on the next morning, however, we followed his 'spoor,' and soon came to the spot where he had passed the night. The sand here was one patch of blood, and the bushes immediately about were broken and beaten down by his weight, as he had staggered to and fro in his effort to get on his legs again. Strange to say, however, we here lost all clue to the beast. A large troop of Lions that had been feasting on a Giraffe in the early morning had obliterated his tracks; and it was not until some days afterwards, and when the carcase was in a state of decomposition, that his death was ascertained. He breathed his last very near to where we were 'at fault,' but in prosecuting the search we had unfortunately taken exactly the opposite direction."

CHAPTER III.

THE CAT FAMILY—THE TIGER AND THE LEOPARD.

THE TIGER—Its Colour, Size, &c.—Geographical Distribution—Mention of the Tiger by Ancient Writers—Habits of the Tiger—Its Destructiveness—Native Superstitions—Tiger-hunting—THE LEOPARD—Historical Account—External Characters—Size—Geographical Distribution—Varieties—Habits—Love of Dog-meat—Clay-eating Propensities—Attracted by Small-pox Patients.

THE TIGER.*

As the Lion is king of beasts in Central Africa, so the Tiger reigns supreme on a large portion of Southern Asia, where it is the most dreaded foe of the native, and the noblest game of the English sportsman. Its great size, its wonderful activity and strength, its glorious colouring, make it, in many respects, the most striking of all the great Carnivora. The marvellous symmetry of its form, making it almost as much a "line of beauty in perpetual motion" as the Greyhound; the flame-like bands of orange-yellow, with interspersed black shadows, winding over its lithe sides and terrible countenance;

Felis tigris.

the ferocity of its disposition, and its seeming uselessness for anything but destruction, have been the theme of one of the weirdest, most wonderful melodies of the artist-poet Blake, who sings of it thus :—

" Tiger, tiger, burning bright
In the forests of the night,
What immortal hand or eye
Could frame thy fearful symmetry ?

" In what distant deeps or skies
Burnt the fire of thine eyes ?
On what wings dare he aspire ?
What the hand dare seize the fire ?

" And what shoulder, and what art,
Could twist the sinews of thy heart ?
And when thy heart began to beat,
What dread hand ? and what dread feet ?

" What the hammer ? What the chain ?
In what furnace was thy brain ?
What the anvil ? What dread grasp
Dare its deadly terrors clasp ?

" When the stars threw down their spears,
And water'd heaven with their tears,
Did He smile His work to see ?
Did He who made the lamb make thee ?

" Tiger, tiger, burning bright
In the forests of the night,
What immortal hand or eye
Dare frame thy fearful symmetry ? "

A recent writer* is very anxious to depose the Lion from the post of honour usually assigned to him, that the "Royal Tiger" may reign in his stead. And, although Englishmen will never feel quite happy to see the "Emperor of India" put even on an equality with the "British Lion," we can hardly help thinking that an unprejudiced person would consider the flowing mane and tufted tail of the Lion more than counterbalanced by the brilliant colour, more perfect form, and superior size of the Tiger.

The anatomical characters are so similar to those of the other Cats, that it is needless to dwell upon them ; they are, indeed, for the most part so exactly like those of the Lion, that even the illustrious Cuvier is said to have been completely worsted in an attempt to separate the mingled bones of the two species. In the skull, however, the muzzle is shorter than in the Lion, and forms a bolder curve with the forehead, a character very well seen in the living animal, and making the Tiger's face much rounder, and more like that of the Domestic Cat than the Lion's. In the skeleton, as in that of other Cats, the flexibility of the spinal column is very noticeable, as also is the arrangement of the limb bones, especially those of the hind limb, which are so disposed as to form a sort of double C-spring. (See the figure of the Lion's skeleton on p. 5.) When a Tiger leaps, he first crouches down, bending the backbone into a strong downward curve by means of the great muscles which lie beneath it, at the same time contracting the flexor muscles of the limbs, more particularly of the hind limbs, so as to make their three divisions—thigh, leg, and foot—set at an acute angle to one another. He then brings into play the immense extensor muscles, which are especially well developed in all leaping animals, the back and limbs are straightened, and the animal, weighty as it is, is projected forwards with immense force.

The pupil of the eye is round. The tail is long, and devoid of a terminal tuft, and there is no mane like the Lion's, although the cheeks bear large whisker-like tufts of stiff hairs. Similar bristles occur on the chin, lips, and eyebrows, those on the cheek being especially large, and constituting the sensitive *vibrissæ* which are so noticeable in most Cats, as well as in many other animals. All these

* Sir Joseph Fayrer : "The Royal Tiger of Bengal : his life and death."

hirsute appendages are capable of being erected when the animal is angry. For this purpose the bulb-like ends of them, which are imbedded in the skin, are covered with slips of muscular fibre from the great cutaneous muscle—that by which quadrupeds are enabled to "shiver" their skins—and these

SCENE IN THE JUNGLE.

hair muscles are provided with an abundant supply of nerves. When the muscles contract, they make the hairs "stand on end," producing a sort of magnified "goose-skin." The vibrissæ are especially sensitive, and are of great assistance to the Tiger as he makes his way through the jungle in the dark.

The great distinctive character is, of course, the colour. Of this, and of the main points of difference between the two sexes, Sir J. Fayrer writes as follows:—"The colour of a full-grown

TIGER.

Tiger in good health is exceedingly beautiful. The ground is of a rufous or tawny-yellow, shaded into white on the ventral surface. This is varied with vertical black stripes, or elongated ovals or brindlings. On the face and on the back of the ears the white markings are peculiarly well defined, and present an appearance as remarkable as beautiful. The depth of shade of the ground colour, and the intensity of the black markings, vary according to the age and condition of the animal. In old Tigers the ground becomes more tawny, of a lighter shade, and the black markings better defined. The young are more dusky in the ground colouring than the middle-aged or old

DYING MAN-EATER.

Tigers. The depth of colour is also affected by locality and climate. Those found in forests are often of a deeper shade than Tigers found in more open localities. It is said that in more northern latitudes they are of a lighter colour, almost white. The circular white patches on the back of the ears, and the white and black about the face, are very conspicuous in the Tiger, rushing through the grass or jungle when disturbed. Brilliant as is the general colour, it is remarkable how well it harmonises with the grass or bush among which he prowls, and for which, indeed, until his charge, and the short deep growls or barkings which accompany it, reveal his presence, he may be mistaken. The Tigress differs from the Tiger; the head, as well as the whole body, is smaller and narrower. The neck is lighter, and is devoid of any crest, which, though very much smaller than the voluminous mane of the Lion, undoubtedly exists in large and old males. The Tigress is lither, more active, and when accompanied by her offspring, far more savage and bloodthirsty than the male; she will then attack, even when unprovoked; and in defence of her young, of which she is proverbially fond, is as courageous

as she is vicious. Most of the accidents that have befallen sportsmen and others who have encountered these animals have been due to Tigresses. "I have seen a Tigress, accompanied by her young, charge, unprovoked, a line of Elephants, and inflict severe injuries before she was despatched. The only well-authenticated case in which a sportsman was taken out of a howdah was one in which a Tigress, in one bound, reached the sportsman, her hind feet resting on the Elephant's head, the fore feet on the rail of the howdah. The occupant, who had mortally wounded her as she sprang, was seized, and, after a short struggle, dragged or thrown to the ground. The Tigress then received another bullet, and died where she fell; the sportsman, severely wounded, was carried into camp, and slowly recovered."

As to the size of adult animals, the same author has the following remarks:—

"It is generally admitted that the Tiger attains the greatest size in India, and there can be no doubt that he is really the largest of the existing *Felidæ*. . . . . The size of the Tiger varies; some individuals attain great bulk and weight, though they are shorter than others which are of a slighter and more elongated form. The statements as to the length they attain are conflicting and often exaggerated; errors are apt to arise from measurements taken from the skin after it is stretched, when it may be ten or twelve inches longer than before removal from the body. The Tiger should be measured from the nose along the spine to the tip of the tail as he lies dead on the spot where he fell before the skin is removed. One that is ten feet by this measurement is large, and the full-grown male does not often exceed this, though no doubt larger individuals (males) are occasionally seen, and I have been informed by Indian sportsmen of reliability that they have seen and killed Tigers over twelve feet in length. The full-grown male Indian Tiger, therefore, may be said to be from nine to twelve feet, or twelve feet two inches, the Tigress from eight to ten, or perhaps, in very rare instances, eleven feet in length, the height being from three to three and a half, or, very rarely, four feet at the shoulder. But we must look with doubt on Buffon's statement that one had attained a length of fifteen feet; and with even greater hesitation can we accept the recorded statement that Hyder Ally presented a Tiger to the Nawab of Arcot that measured eighteen feet."

The Tiger is entirely confined to Asia, where its range is very wide, extending from the Caspian to the Sea of Okhotsk, and from latitude 50° southwards. It has been found in the Elburz Mountains, Bokhara, China, Malaysia, Sumatra, Borneo, Java, and Bali. It is known about Ceylon and from the great table-land of Tibet. Its head-quarters are North India, where great numbers are killed annually. From what has been said, it will be evident that the Tiger is by no means, as one is very apt to imagine, an altogether tropical animal; the Caucasus, the western limit of its range, is far from being a warm region, and its eastern limit, the island of Saghalien, is as far north as Kamtchatka. It has been found also at a height of 8,000 feet above sea-level. It is an interesting circumstance that the Tigers found amongst the snows of Mantchuria and Corea have the "body covered with long softish hairs," and a shaggy ruff round the neck. Thus, as is so constantly the case, a definite variety is produced solely by the action of surrounding conditions. Certain Tigers find it advantageous to live farther north than the generality of their kind, so as to have a freer field for their depredations than would be afforded to them by the more southern districts, and, to suit themselves to the vigorous climate, acquire long warm fur, such as would be quite out of place on the back of a denizen of the Bengal jungles.

It is a somewhat remarkable circumstance, considering the nearness of Palestine to the Caucasus and Elburz Mountains, that the Tiger is not once mentioned in the Bible. It was, however, well known to the Greeks and Romans, and, like the Lion, was a regular performer at the amphitheatre. The district called Hyrcania, a tract of land lying to the south-east of the Caspian Sea, seems to have been the most noted spot for Tigers. In the "Æneid." Dido, in her magnificent declamation against the perfidy of Æneas, is made to say—

> "Nec tibi Diva parens, genitus nec Dardanus auctor,
> Perfide, sed duris genuit te cautibus horrens
> Caucasus, *Hyrcanæque* admôrunt ubera tigres."

> "(Perfidious monster! boast thy birth no more;
> No hero got thee, and no goddess bore:
> No! thou wert brought by Scythian rocks to day,
> By Tigers nurs'd and savages of prey."

and Shakspere uses the same expression:—

> "The rugged Pyrrhus, like the *Hyrcanian* beast."

In disposition the Tiger differs but little from the other wild *Felidæ*. Although possessed of such immense strength and ferocity, he often shows himself a very coward. Like most animals he scarcely ever attacks an armed man unless provoked, that is, unless he (or she) be a confirmed "man-eater," although often seizing upon women and children. He shares with our Domestic Cat a love of cruelty for its own sake. The author of "Rambles in the Mirzapore District" says of this essentially feline character:—"It is sometimes an interesting sight to witness the demeanour of a Tiger towards his terrified prey (*i.e.*, when a victim is tied up for him, and the sportsman waits to shoot him in the tree above it). When not raging with hunger, he appears to derive the same pleasure from playing with his victim as a Cat in tormenting a Mouse. He gambols around the Buffalo as if enjoying his alarm; and when the affrighted animal, in mad despair, feebly attempts to butt at his remorseless foe, the Tiger bounds lightly over his head, and recommences his gambols at the other side. At last, as if he had succeeded in creating an appetite for dinner, he crushes the skull of his victim with one blow of his powerful fore-paw, and soon commences his bloody meal."

Another point in which the Tiger resembles the Cat is the devotion of the female to her offspring, and the remarkably lively and skittish disposition of the "kittens," of which from two to five are usually produced at a birth. These are at first about half the size of our Domestic Cat. The mother goes with young about 105 days, the breeding season being in the early part of the year, but varying slightly according to locality. She is a most affectionate and attached mother, and generally guards and trains her young with the most watchful solicitude. They remain with her until nearly full grown, or about the second year, when they are able to cater for themselves. Whilst they remain with her she is peculiarly vicious and aggressive, defending them with the greatest courage and energy, and when robbed of them is terrible in her rage; she has nevertheless been known to desert them when pressed, and even to eat them when starved.

As soon as they begin to require other food than her milk she kills for them, and teaches them to do so for themselves by practising on small animals, such as Deer, and young Calves and Pigs. At these times she is wanton and extravagant in her cruelty, killing apparently for the gratification of her ferocious and bloodthirsty nature, and, perhaps, to excite and instruct the young ones, and it is not until they are thoroughly capable of providing their own food that she separates from them.

The young Tigers are far more destructive than the old. They will kill three or four Cows at a time, whilst the elder and more experienced rarely kill more than one, and this at intervals of from three or four days to a week. For this purpose the Tiger will leave its retreat in the dense jungle, proceed to the neighbourhood of a village, and during the night will steal towards the herds and strike down a Bullock, drag it into a secluded place, and then remain near the "marrie," or kill, for several days, until it has eaten it, when it will proceed in search of a further supply. When it has once found good hunting-ground in the vicinity of a village, it continues its ravages, destroying one or two Cows or Buffaloes a week. It is very fond of the ordinary domestic cattle which, in the plains of India, are generally weak, half-starved, under-sized creatures. One of these is easily struck down and carried or dragged off. The smaller Buffaloes are also easily disposed of, but the Buffalo Bulls, and especially the wild ones, are formidable antagonists, and have often been known to beat the Tiger off, and even to wound him seriously with their horns.

Some notion of the fearful damages committed by Tigers in India will be gained from the following extract:—"Cattle killed in my district are numberless. As regards human beings, one Tiger in 1867–8–9, killed, respectively, twenty-seven, thirty-four, forty-seven people. I have known it attack a party and kill four or five at a time. Once it killed a father, mother, and three children; and the week before it was shot it killed seven people. It wandered over a tract of twenty miles, never remaining in the same spot two consecutive days, and at last was destroyed by a bullet from a spring gun, when returning to feed on the body of one of its victims—a woman. At Nynee Tal, in Kumaon, in 1856–7–8, there was a Tiger that prowled about within a circle, say, of twenty miles, and it killed, on an average, about eighty men per annum. The haunts were well known at all seasons. . . . . This Tiger was afterwards shot while devouring the body of an aged person it had killed." It is also stated in a Government report that "in one instance, in the Central Provinces, a single Tigress caused the desertion of thirteen villages, and two hundred and fifty square miles of country were thrown out of cultivation. This state of things would, undoubtedly, have continued, but for the

timely arrival of a gentleman who, happily, was fortunate enough, with the aid of his gun, to put an end to her eventful career." Again, it is reported, "that one Tigress, in 1869, killed 127 people, and stopped a public road for many weeks, and was finally killed by the opportune arrival of an English sportsman."

As might naturally be expected, an enemy so dreadful is sure to have supernatural power ascribed to it by the credulous natives, whose property is destroyed, and whose lives are endangered by the ravages of this terrible beast. People in the state of civilisation of the ordinary Indian villages are sure to think there is something more than natural in an animal capable of such wholesale destruction, so wantonly cruel, of such fearful strength and such terrible beauty; and the following passages will give some idea of the prowess ascribed to the Tiger by those who are the greatest sufferers from his bloody disposition :—

"The natives of India, especially the Hindoos, hold the Tiger, as they do the Cobra, in superstitious awe. Many would not kill him if they could, for they fear that he will haunt them or do them mischief after death. Some they regard as being the tenement of a spirit, which not only renders them immortal, but confers increased powers of mischief. In many parts of India the peasants will hardly mention the Tiger by name. They either call him, as in Purneah, Giahur (Jackal), Janwar (the beast), or they will not name him at all; and it is the same in the case of the Wolf. But though they will not always themselves destroy him, they are quite willing that others should do so, for they will point out his whereabouts, and be present at his death; and the delight evinced thereat is intense, for it often relieves a whole village from an incubus of no slight weight, and saves the herdsman from his weekly loss of cattle. The conversation and remarks made by these villagers round the fallen Tiger are often very amusing and characteristic.

"All kinds of power and influence are ascribed to portions of him when dead; the fangs, the claws, the whiskers, are potent charms, medicines, love-philtres, or prophylactics against disease, the evil eye, or magic. They are in such demand that the natives *will* take them; and we have known whiskers, claws, and even fangs, extracted and carried away during the night, even when the dead Tiger has been placed under the surveillance of a guard. The fat, also, is in great demand, for its many potent virtues in relieving rheumatism and other ailments. The liver, the heart, and the flesh are taken away and dried, to be eaten as tonics or invigorating remedies that give strength and courage. There is also a popular delusion that a new lobe is added to the liver every year of his life. A Tiger's skin with its whiskers preserved is a rarity; you cannot keep them. The domestic, who would preserve any other valuable as a most sacred trust, will fail under this temptation! The whiskers, besides other wonderful powers, are said to possess that of being a slow poison when administered with the food. Such is the belief, which you may try in vain to disturb! The clavicles, too—little curved bones like tiny ribs—are also much valued; but they are generally lost or overlooked when the Tiger is cut up, lying buried in the powerful muscles near the shoulders."

It is a very common opinion that the wounds made by a Tiger's claw or teeth are poisonous, and consequently highly dangerous. It is, however, hardly necessary to state that the Tiger's venom is of quite the same nature as that of the Frog and Newt, which so many country people believe in devoutly to this day. The huge jagged canines, and the carefully sharpened claws make wounds which are certainly ugly enough, but their danger arises merely from their depth, and from their liability to fester in a hot climate.

Of course Tiger-hunting is, *par excellence*, the "royal sport of India;" the game calling forth more courage and address from the sportsman than any other, and the "spice of danger" so necessary to the true sportsman being at its maximum. Usually, a hunt is made up of a considerable number of sportsmen, accompanied by a crowd of beaters. The Elephant upon which each hunter rides is provided with a houdah of light wood and basket work, and consisting of two compartments, a front one in which the sportsman himself sits, and a hinder one occupied by his servant, who is in readiness with spare guns. The driver, or mahout, sits on a cushion on the Elephant's neck, armed with a pointed iron rod, or *gujbug*, to every touch of which the docile animal answers.

On arriving at a portion of the jungle where Tigers are known to exist, the sportsmen hold themselves in readiness with loaded rifles, while the beaters, on foot, encircle the jungle, and endeavour, with shouts and gesticulations, to drive the game from their lurking-place to the

destruction which awaits them. As soon as a Tiger appears every piece is levelled at him, and, in many cases, he is despatched at once; but often he is either entirely missed, or only slightly wounded, and then he at once makes for the nearest Elephant, and often succeeds in making Elephant, or mahout, or even sportsman, feel his cruel teeth and claws, before the *coup de grace* is given. A Tiger is at no time the easiest thing to kill; like its humble kinsman, the Cat, it has "nine lives" to part with, and these lives are much more tenacious than in the case of poor puss. A Tiger, holding on

TIGER HUNT.

with tooth and claw to a writhing Elephant, in such a position that a mis-directed shot may kill man or Elephant instead of Tiger, is an extremely awkward beast indeed to deal with, and is often enabled to sell his life very dearly. When the day's sport is over, the Tigers are either carried into camp on pad Elephants, or skinned where they lie; the natives possessing themselves of the flesh, and everything else of which they can lay hold.

The foregoing is the legitimate method of keeping down the Tiger race, but many others are employed. "They are snared in pitfalls and traps, shot by spring-guns and arrows, occasionally poisoned, and it is said that bird-lime has been used in their destruction. I have read of this, but know of no authenticated case in which it has been practised. The bird-lime, it is said, is spread on the fallen leaves; these adhering to the Tiger's paws are soon plastered all over him, including his face and eyes. Blinded and stupefied by rage and fear, he falls an easy prey to the villagers,

who then either shoot or stab him to death with spears. Another mode of effecting his death is to lay a bait, by tying up a Cow or Goat in some spot the Tiger is wont to frequent. Near this, on a machán, or on the branch of a tree, or from behind some extemporised screen, the shikarie waits his approach at night, and when the bait is seized takes aim, and often succeeds in destroying him, though it not unfrequently happens that in the uncertain light he misses altogether, or only wounds, in which case a second chance is seldom obtained."

The perils of Tiger-hunting are great and varied. In the following instance related by Sir Joseph Fayrer a large comic element was introduced, although the fun is probably more striking to us to read of than it was to the hunter and his mahout who took part in it:—

"A rather curious Tiger-hunt, in which the Tiger seemed to think that he should have his share of the sport as well as the 'shikarie,' occurred some short time ago in the Dhoon. A gentleman, well known in Dehra, an enthusiastic though rather inexperienced sportsman, they say, went out about a month ago, into the Eastern Dhoon, for a day or two's shooting. Arrived on the ground, he was seated in his houdah on the Elephant, looking out anxiously for game of some sort, when the mahout suddenly cried, 'Shér, Sahib; burra, Shér!' for a Tiger had made his appearance unexpectedly close to the Elephant. The gentleman hurriedly fired, and planted a ball from his rifle, not in the Tiger's shoulder, but in his abdomen. This mistake must have been due to surprise at the Tiger's sudden advent on the scene, and the consequently hurried shot; otherwise such a want of knowledge of anatomy as was evinced in seeking a vital spot in the abdomen would be unpardonable. The consequences of the mistake were serious; for the Tiger, resenting the sudden disturbance in the region where the remains of his last kill were peacefully reposing, charged the Elephant, and, by a spring, succeeded in planting his fore-paws on her head, while his hind legs clawed and scratched vigorously for a footing on her trunk.

"Imagine the feelings of the mahout, with a Tiger within six inches of his nose! the Elephant trumpeting, shaking, and rolling with rage and pain, till he was barely able to maintain his seat on her neck at all; and the occupant of the houdah, too, tumbled from top to bottom, and from side to side of it, as if he were a solitary pill in a pillbox too large for him. Of course, in this predicament, he was utterly unable to use his rifle to rid the Elephant of the unwelcome head-dress she was, perforce, wearing. The attempt to fire, in all that shaking, would probably have resulted in his blowing out the mahout's brains instead of the Tiger's, or in his shooting himself. Meanwhile the mahout, with the courage of despair, slipped out of the *guddela*, or cushion, on which he sat, and, rolling it round his left arm, and taking the iron *gujbag* in his right, assailed the Tiger manfully about the ears. But, being thick-headed, he did not seem to mind the *gujbag* at all; for, after taking a bite at the Elephant's forehead, he calmly continued his struggles for a footing on the reluctant and ever-dodging trunk, heedless of the rain of blows on his thick skull, and, no doubt, promising himself to square accounts presently by swallowing the mahout, *gujbag*, and all. But the Elephant was beginning to see that she couldn't shake the Tiger off, so she tried another plan; and, making an extempore battering-ram of herself, with the Tiger as a buffer, she charged straight at a sal-tree, thinking to make a Tiger-pancake on the spot. But the sal-tree, alas! was a small one, and gave way under the shock, and away went tree, Tiger, and Elephant into an old and half filled-up *obi*, or Elephant pit, which happened to be conveniently placed to receive them just on the other side of the fallen tree. The Tiger and the mahout were both knocked off by the shock and fall; but the latter, luckily for himself, fell out of the pit, the former into it, under the Elephant. The Elephant now had her share of the sport, and gave the Tiger such a kicking while he lay under her, making a kind of shuttlecock of him between her fore and hind legs, that the breath must have been almost kicked out of him; then deeming she had done enough for honour and glory, and that she couldn't eat the Tiger if she did kill him, she commenced climbing out of the pit, whose crumbled and sloping sides luckily made the scramble out practicable. The mahout, who had by this time picked himself and his scattered wits up, rushed round and caught her by the ear just as she reached the level, and was preparing for a bolt, and scrambling rapidly up to his perch on her neck, succeeded in stopping her and turning her face to the foe once more. The Elephant being now under command, our sportsman at length resumed his proper share in the proceedings, and the Tiger being still at the bottom of the pit, breathless, if not senseless, from the kicking he had undergone, by a well-directed shot put him finally *hors de combat*,

and had the satisfaction of carrying him into the station in triumph, where his skin is preserved as a witness of this strange Tiger-hunt. The Elephant, though it got one nasty bite, and was badly scratched about the trunk and fore-legs, is now none the worse for its single combat with the monarch of the Indian forests."

We mentioned above that the Tiger rarely attacks man unless provoked. When, however, he is hard pressed for a meal, he will often visit inhabited spots, and then is as likely to choose human as bovine food. Imagine the sensation likely to arise in a small village, inhabited only by a few unarmed, or at least but poorly armed men, with their wives and children, by such an occurrence as the following, related by an English traveller:—

"On the 11th of November of the same year I chanced to meet a Tiger myself. I was on the shore of the mainland opposite Amoy, in the afternoon, looking out for small birds, in company with a friend. I carried a gun, but had only small shot and one cartridge. Some villagers came running to us crying 'Go and shoot the Tiger!' I thought they were making game of us, until some of them assured us that there really was a Tiger in a neighbouring village, and that they would be much obliged if we would kill it. They led us to a village at the foot of a hill near the shore, where we found men, women, and children huddled outside in great alarm. Many of the men were armed with matchlocks. They desired us to take off our boots, and one of the men guided us over the roofs of the houses to the last house near the hill, and, pointing to a large rock, he made us listen. We could distinctly hear growls, and peering over I saw the lips and feet of the Tiger under the overhanging rock. The house on which we stood presented a wall facing the rock, and about two yards distant. We went inside, and I persuaded the owner to make a hole in the wall. I had no means of drawing the charge of my gun, so I rammed down a cartridge on the top of the small shot in one barrel, and a few hollow buttons into the other. In the hurry and excitement no bullets or iron nails were forthcoming. The Tiger noticed the hole in the wall, but only growled. I fired the button barrel first, aimed at its neck, but he only answered by a growl, and I saw that the buttons had done no more than turn up the skin without penetrating. His jaw was full towards me, and I gave him the cartridge right between his eyes. He gave a furious roar, and bounded into the garden, where he stood for some seconds bleeding from the nose, and with his tongue lolling from his mouth. I had no more cartridges with me, so I loaded again with the metal-edged buttons which the villagers tore off their coats for me. The Tiger had moved away, and I tracked him by his blood into a dilapidated temple. I looked in at the window, and there stretched beside a coffin sat the noble beast. He turned his head and growled as he saw me, and, without a moment's thought I raised the barrels and fired another shower of buttons in his face. I turned and fled; but a roar followed which I shall never forget, and I found myself, breathless, at the bottom of a precipice, with my gun upraised, expecting to see the angry creature upon me; but strange enough he did not follow. The villagers, who were assembled two hundred yards away, all ran when I ran; but seeing the Tiger did not pursue, one of them came forward and put me on his knees, and patting me on the back, helped to bring back my breath, which I had lost by the fall. We crept up to the window again. Every one of the thick wooden bars had been knocked out by the force of the leap; but from the blood only splashing the outside of the window, it was evident the Tiger had not come out of the building. We looked in at the window, and just below, outstretched on the floor in a pool of blood, lay the Tiger. I threw up my hand and shouted to my friend, who watched the proceedings at a distance, that the Tiger was dead. At the noise, the Tiger raised his head and growled. He was a Cat, of course, and had the usual nine lives. I went to the villagers and proposed a joint attack, but they would not consent. Some of them ascended the hills behind and fired on to the roof of the house in which the Tiger was sheltered. It was getting dark, so breathless and hurt I took boat and returned to Amoy. A few hours after the Tiger is said to have moved away; but whether he died or recovered his wounds I could never satisfactorily learn, so contradictory were the stories told."

Mr. Thomson recounts a tale of a planter in this province, who, returning home after a carouse, a little too much under the influence of Scotch whisky, was sorely bested by a Tiger. "It was rather dark, and verging on the small hours of morning when MacNab, mounting on his trusty steed, set his face towards home. Feeling at peace with all men, and even with the beasts of prey, he cantered along a road bordered with mangroves, admiring the fitful gleams of the fire-flies that were

lighting their midnight lamps among the trees. But soon the road became darker, and Donald, the pony, pricked his ears uneasily as he turned into a jungle-path which led towards the stream. Donald snuffed the air, and soon redoubled his pace, with ears set close back, nostrils dilated, and bristling mane. Onward he sped, and at last the angry growl of a Tiger in full chase behind roused MacNab to the full peril of his position, and chilled his blood with the thought that his pursuer was fast gaining ground, and that at any moment he might feel the clutch of his hungry and relentless claws. Here was a dilemma, the cold creek before him, and the hot breath of the Tiger in the rear. A moment or two were gained by tossing his hat behind him, and then Donald cleared the stream at a bound. The Tiger lost his scent, and Mr. MacNab reached home in safety, by what he delighted to describe as a miraculous escape."

To us, who "live at home at ease," life would seem to be hardly bearable in a place when one is liable, any day, to meet with such an adventure as this—with every chance, too, of a less pleasant termination. But it is astonishing how indifferent to the presence of wild beasts the inhabitants of these countries become. Even Europeans soon acquire the same fearlessness, or, rather, apathy. Of this Mr. Thomson gives a striking illustration:—"In these sparse settlements of Malays and Chinese, Roman Catholic missionaries are at work. I once fell in with one of these priests, shod with straw sandals, and walking alone towards Bukit, Mer-tangrim (the pointed hill), to visit a sick convert who had a clearing upon the mountain-side. His path lay through a region infested with wild animals; and when I inquired if he had no dread of Tigers, he pointed to his Chinese umbrella, his only weapon, and assured me that with a similar instrument a friend of his had driven off the attack of a Tiger not very far from where we stood. But the nervous shock which followed that triumph had cost the courageous missionary his life."

THE LEOPARD.*

The Leopard, or Panther, is undoubtedly the third in importance and interest of the great Cats. From a historical point of view it is more interesting than the Tiger, and would naturally come immediately after the Lion, but its size, ferocity, and beauty are so very inferior to the Tiger's that it must needs yield to the glorious Bengalee. In the matter of beauty alone it is eclipsed by the Jaguar, but the fact of its having been known from very ancient times, and that of its occurrence in our own hemisphere, must decide us, in the absence of any important characters, anatomical or otherwise, to give it the precedence of its very nearly related American cousin.

The Leopard was the only one of the greater feline animals, except the Lion and Tiger, that seems to have been known to the ancients. It is always represented as drawing the chariot of Bacchus, and the forlorn Ariadne is sculptured as riding on one of the spotted steeds of her divine lover. The Panther was also constantly used in the barbarous sports of the amphitheatre, and, in common with the Lion and Tiger, has been both executioner and grave to many a bold-hearted martyr.

The Leopard's skin was a favourite mantle in the olden times in Greece. In the "Iliad," Homer, speaking of Menelaus, says—

> "With a Pard's spotted hide his shoulders broad
> He mantled o'er."—

and the Leopard, or Panther, is given in the "Odyssey" as one of the forms assumed by Proteus, "the Ancient of the Deep."

A curious ancient superstition about the Leopard is embodied in its name. It was thought not to be actually the same animal as the Panther or Pard, but to be a mongrel or hybrid between the male Pard and the Lioness: hence it was called the Lion-panther, or *Leopardus*. This error, as Archbishop Trench tells us, "has lasted into modern times; thus Fuller, 'Leopards and Mules are properly no creatures.'" Another word-combination was made by the Romans when wishing to find a name for the Giraffe. It is "a creature combining, though with infinitely more grace, yet some of the height and even the proportions of a *Camel*, with the spotted skin of the *Pard*." They called it "Camelopardus," the Camel-panther.

Some authors give it as their opinion that the Leopard outshines all the great beasts of prey

* *Felis pardus.*

in beauty and elegance, and, indeed, called it *the* Carnivore *par excellence*. Unfortunately, most English people have no means of forming a true opinion on a matter of this sort, as we see the animals only in menageries; but judging from the specimens we have seen in confinement, we should incline to the belief that it is far behind both the Lion and Tiger, and is even beaten by the Jaguar in the matter of colouring, although the surly look of the latter makes him, on the whole, a far less attractive beast. The adult Leopard in the London Zoological Gardens is perhaps the clumsiest brute in the whole Lion-house—fat, bull-necked, and stupid-looking. Stupid-looking, and even clumsy, that is, when lying lazily asleep on the floor of his den; but watch him when four o'clock comes, and the meat-barrow goes round, and then where will you find more marvellous agility? All the Cats are

LEOPARD.

alike in this; they are very lazy at times, but when they *do* begin to move, there is no more complete example of perfectly graceful movement, and one feels as if he could watch them "on and off for days and days," as Alice's frog-footman puts it.

The characters of the hide are so characteristic that they must be given in some detail, especially as the spots must be distinguished from those of the Jaguar, the great spotted Cat of the New World. The skin is described as follows:—"On an orange-yellow ground, passing below into white, are spots of deep or brownish-black, sometimes distinct, sometimes composed of two, three, or even four points disposed in a circle, and surrounding a space, always somewhat darker than the ground-colour, and shading into it below. On the medio-dorsal line, in the hinder part of the body, the spots are so arranged as to produce three or even four regular parallel bands. On the side of the body, also, bands are found, but they are indefinite in number, and irregularly disposed. On the head and legs, the circular spots pass by degrees into mere points. The belly is strewn with great double points, irregularly disposed, and on the legs the points, also double, unite and form bands. The tail is

covered over the greater part of its length with annular spots. On the hinder part of the ears is a clear spot."

It must not be supposed, however, that all Leopards have exactly the kind of marking here described, for it varies according to habitat, age, sex, and season. Still, the skin-markings are definite enough to enable one to tell the true Leopard, either from the Hunting Leopard (Cheetah), the Jaguar, or the Clouded Tiger, the only animals with which there is any possibility of confounding it.

In size the Leopard is decidedly inferior to either the Lion or Tiger; being not more than some seven feet six inches from snout to tip of tail, and two feet seven inches high at the shoulder. The tail itself is about three feet eight inches long. The female is somewhat smaller than the male, to which the above measurements apply. The whiskers are strong and white, and the eyes yellow.

The head-quarters of the Leopard are the African continent, where its range is almost co-extensive with the Lion's, as it occurs from Algeria in the north to Cape Colony in the south. In the latter locality it is known by the settlers as the Tiger, but this is quite a misnomer. The Tiger of the Cape colonists is a *spotted*, not a *striped* Cat, and is indeed nothing but the African variety of the Panther. Like the Lion, the Leopard extends into Asia, penetrating, however, much farther into that continent than the king of beasts. In the western parts of Asia it occurs, amongst other places, in Palestine, where "it is found all round the Dead Sea, in Gilead, and Bashan, and occasionally in the few wooded districts in the West." Leopards are found in Ceylon, where they are the only great Carnivores, but where they are neither very numerous nor very dangerous, as they seldom attack man. By the Europeans the Ceylon Leopard is erroneously called a Cheetah, but the true "Cheetah" (*Felis jubata*), the Hunting Leopard of India, does not exist in the island.

The Leopard is found at its extreme easterly range in Japan, where it occurs under a distinct variety, known as the "Northern Leopard," the skin of which is "much like that of a fine-coloured Hunting Leopard, but it is at once distinguished by the comparatively shorter legs, by the larger size and brown centre of the black spots, and from all the varieties of the Leopard by the linear spots on the nape and the spots on the back not being formed of roses or groups of spots. The skin in its tanned state is four feet six inches, and the tail two feet ten inches long."

Another variety from Formosa is distinguished by the shortness of its tail, which is not more than a foot and three-quarters long, or about half the length of that of its African brother. Some naturalists propose to consider both these varieties as distinct species, but such characters as the length of the tail and the form and disposition of the spots are eminently variable, and when we consider that another Leopard from Formosa has been described with a tail one foot one inch long, and another whose caudal appendage was two feet seven inches in length, we shall certainly be justified in concluding that such slight difference must have been produced by the innate tendency of all animals to vary in unimportant particulars, and by the influence of surrounding conditions, and we may safely put all these various kinds of Leopard under the common label *Felis pardus*.

There is, however, one very interesting character about the "Northern Leopard" which, although by no means entitling it to rank as a species, yet makes it a very instructing instance of the way in which a breed or race is produced by the modifying influence of climate. The animal in question is found not only in Japan, but in Mantchuria, "extending probably to Corea, and the Island of Saghalien," and is remarkable from the fact that its hair is long and shaggy, a condition of things evidently brought about by the cold climate it has to endure. Hence we see that the British climate need not have differed from its present condition to have been the home, as indeed it once was, of the larger beasts of prey.

Perhaps the most interesting variety of this species is the Black Leopard of Java. It has exactly the appearance of an ordinary Leopard painted black, the paint, however, not being laid on sufficiently thick to hide the spots, which are of a more intense black than the rest of the hide. The Black Leopard is sometimes described as a distinct species, and is called *Leopardus melas*, but there can be very little doubt that it is, in reality, a mere variety, differing only in colour—the most variable of characters—from the common kind. It is, however, so singular as to require the special notice which we have given it.

"Leopards frequent the vicinity of pasture-lands in quest of the Deer and other peaceful animals which resort to them; and the villagers often complain of the destruction of their cattle by these formidable marauders. In relation to them the natives have a curious but firm conviction that when a Bullock is killed by a Leopard, and, in expiring, falls so that *its right side is uppermost*, the Leopard will not return to devour it. I have been told by English sportsmen (some of whom share in the popular belief), that sometimes, when they have proposed to watch by the carcase of a Bullock recently killed by a Leopard, in the hope of shooting the spoiler on his return in search of his prey, the native owner of the slaughtered animal, though earnestly desiring to be avenged, has assured them that it would be in vain, as, the beast having fallen on its right side, the Leopard would not return.

"The Singhalese hunt them for the sake of their extremely beautiful skins, but prefer taking them in traps and pitfalls, and occasionally in spring cages formed of poles driven firmly into the ground, within which a Kid is generally fastened as a bait, the door being held open by a sapling bent down by the united force of several men, and so arranged as to act as a spring, to which a noose is ingeniously attached, formed of plaited Deer's hide. The cries of the Kid attract the Leopard, which, being tempted to enter, is enclosed by the liberation of the spring, and grasped firmly round the body by the noose."*

There is a Scottish adage which says that "Hawks will not peck out hawks' een;" but the Leopard, a Carnivore, has a confirmed liking for the flesh of the flesh-eating Dog. This fact has been observed by a writer who states that the Leopard has quite a mania for that sort of diet, and will not hesitate to penetrate into a tent at night in quest of his favourite game.

There is a rather curious habit of the Leopards which we have observed at the Zoological Gardens, though whether it holds good with all Leopards we are not prepared to say, never having seen the circumstance mentioned. The Lion and Tiger, when devouring their reeking bones at their four o'clock dinner, at Regent's Park, lie down at full length, and hold the meat between their fore-paws, in this way steadying it while they take their tremendous bites. The Leopards, on the other hand, do not lie down, but squat on their haunches, the fore-legs being kept almost vertical, and the head, of course, correspondingly bent down to reach the food. The paws are rarely used to steady the piece of meat, and only, in fact, when the beast comes across a particularly fractious morsel which he finds it impossible to manage with his teeth alone. For this reason, a Leopard in the act of feeding is a far more awkward-looking beast than the Lion or Tiger, both of which hold their food in quite a civilised way.

In connection with the Leopard's mode of feeding, we may mention a curious tale about its diet. There can be little doubt that it is a mere "yarn," or rather a piece of folk-lore, but still it is interesting, especially when we think of the many tales of clay-eating men:—"The natives [of Ceylon] assert that it devours the *kaolin* clay, called by them *kiri mattee*, in a very peculiar way. They say that the Cheetah [Leopard] places it in lumps beside him, and then gazes intently on the sun, till, on turning his eyes on the clay, every piece appears of a red colour like flesh, when he instantly devours it."

As a rule, the Leopard seems to be far more cowardly than the Lion or Tiger. Jules Gérard, the Lion-killer, holds the beast in the greatest contempt for its pusillanimity. Still, it often shows a good deal of pluck, chiefly, however, when in want of food. As to this matter, the actual experience of those who have observed the animal in its native land will convey a truer idea than any summing up of its good and bad points. "One night I was suddenly awoke by a furious barking of our Dogs, accompanied by cries of distress. Suspecting that some beast of prey had seized upon one of them, I leaped, undressed, out of my bed, and, gun in hand, hurried to the spot whence the cries proceeded. The night was pitchy dark, however, and I could distinguish nothing; yet, in the hope of frightening the intruder away, I shouted at the top of my voice. In a few moments a torch was lighted, and we then discovered the marks of a Leopard, and also large patches of blood. On counting the Dogs, I found that 'Summer,' the best and fleetest of our kennel, was missing. As it was in vain that I called and searched for him, I concluded that the Tiger [Leopard] had carried him away; and, as nothing further could be done that night, I again retired to rest; but the fate of the poor animal

* Sir James Emerson Tennent, "Sketches of the Natural History of Ceylon."

continued to haunt me, and drove sleep away. I had seated myself on the front chest of the wagon, when suddenly the melancholy cries were repeated, and on rushing to the spot, I discovered 'Summer' stretched at full length in the middle of a bush. Though the poor creature had several deep wounds about his throat and chest, he at once recognised me, and, wagging his tail, looked wistfully in my face. The sight sickened me as I carried him into the house, where, in time, however, he recovered. The very next day 'Summer' was revenged in a very unexpected manner. Some of the servants had gone into the bed of the river to chase away a Jackal, when they suddenly encountered a Leopard in the act of springing at our Goats, which were grazing, unconscious of danger, on the river's bank. On finding himself discovered, he immediately took refuge in a tree, when he was at once attacked by the men. It was, however, not until he had received upwards of sixteen wounds—some of which were inflicted by poisoned arrows—that life became extinct. I arrived at the scene of conflict only to see him die. During the whole affair, the men had stationed themselves at the foot of the tree, to the branches of which the Leopard was pertinaciously clinging, and, having expended all their ammunition, one of them proposed, and the suggestion was taken into serious consideration, that they should pull him down by the tail."

One of the most remarkable circumstances related about the Leopard is the way in which it is attracted by persons suffering from small-pox: the odour attending that disease seems to have an irresistible fascination for them. Sir Emerson Tennent says that the medical officers at small-pox hospitals have to take special precautions against Leopards, which invariably haunt the spot.

As with the other *Felidæ*, the only value of the dead Leopard is the price of its skin, no truly carnivorous animal being good eating; although it is related that one of the South African tribes will eat the flesh, not only of the Leopard, but even of the Hyæna, when they are hard pressed for food.

CHAPTER IV.

THE CAT FAMILY: THE JAGUAR, THE SMALLER WILD CATS, THE DOMESTIC CAT.

THE JAGUAR—Its Character, Distribution, and Habits—Fondness for Negroes—THE PUMA—Its Character, Geographical Range, and Habits—Mode of Hunting the Puma—THE OUNCE—THE CLOUDED TIGER—The Character of its Fur, &c.—Its Habits—THE OCELOT—THE MARBLED TIGER-CAT—THE VIVERRINE CAT—THE PAMPAS CAT—THE LONG-TAILED TIGER-CAT—THE MARGAY—THE COLOCOLO—THE JAGUARONDI—THE EYRA—THE SERVAL—THE RUSTY-SPOTTED CAT—THE LEOPARD CAT THE BAY CAT—THE SPOTTED WILD CAT—THE MANUL—THE EGYPTIAN CAT—THE COMMON WILD CAT—THE DOMESTIC CAT—Historical Sketch—Characters of Skin, &c.—Connection between Whiteness and Blindness—Habits—Use of Whiskers—Diet—Poaching Propensities—Fondness for Offspring—Foster-Children—Madness in Cats—Varieties—The Angora Cat, Manx Cat, Persian Cat, and Chinese Cat.

THE JAGUAR.*

THE Jaguar takes the place of the Leopard in America, where it is the most formidable of beasts of prey. It extends across the whole of the central part of the continent; its northern limit being the south-west boundary of the United States.

It is a slightly larger animal than the Leopard, fierce and sulky in expression, but more elegant in form, and far handsomer as to its skin. The spots are arranged in larger and more definite groups, each group consisting of a ring of well-defined black spots enclosing a space of a somewhat darker tawny than the ground-colour, in which lesser spots often occur.

The Jaguar is perhaps the fiercest-looking of all the great Cats, having an extremely ferocious expression and a horrid habit of showing its great fangs. Some time ago we were taken over the fine Lion-house in the Zoological Gardens by the Superintendent, Mr. Bartlett, to whose practical genius for everything that relates to the comfort of the animals under his charge most of the perfections of that structure are due. The little sleeping apartments at the back of the den open by iron doors into a long corridor, and in each of the doors is a small hole about the size of a penny, through which the keeper can look. Mr. Bartlett blew sharply through the hole in the den of the Jaguar's cage, and then allowed us to look through, and there was something terrible in the way the savage beast

* *Felis onca.*

rushed ... the door, growling and "swearing" like a very large and fierce Tom Cat. Even the knowledge of the strong iron door between us and the Jaguar could not prevent us from starting back, there was something so suggestive, in the beast's looks, of being torn to pieces and devoured.

The Jaguar is found in North and South America, extending from the Southern regions of the United States, through Mexico, Central America, and Brazil, as far south as Paraguay. Of its habits, occurrence, &c., the following interesting account is given by Mr. Darwin:*—

"The wooded banks of the great rivers appear to be the favourite haunts of the Jaguar; but

JAGUAR.

south of the Plata, I was told that they frequented the reeds bordering lakes. Wherever they are, they seem to require water. Their common prey is the Capybara, so that it is generally said, where Capybaras are numerous there is little danger from the Jaguar. Falconer states that near the southern side of the mouth of the Plata there are many Jaguars, and that they chiefly live on fish. This account I have heard repeated. On the Paraná they have killed many wood-cutters, and have even entered vessels at night. There is a man now living in Bajada, who, coming up from below when it was dark, was seized on the deck; he escaped, however, with the loss of the use of one arm. When the floods drive these animals from the islands, they are most dangerous. I was told that, a few years since, a very large one found its way into a church at Santa Fé: two padres entering one after the other were killed, and a third, who came to see what was the matter, escaped with difficulty. The beast was destroyed by being shot from a corner of the building, which was unroofed. They commit also at these times great ravages among Horses and

* "Naturalist's Voyage."

cattle. It is said that they kill their prey by breaking their necks. If driven from the carcass, they seldom return to it. The Gauchos say that the Jaguar, when wandering about at night, is much tormented by the Foxes yelping as they follow him. This is a curious coincidence with the fact which is generally affirmed of the Jackals accompanying, in a similarly officious manner, the East Indian Tiger. The Jaguar is a noisy animal, roaring much by night, and especially before bad weather. One day, when hunting on the banks of the Uruguay, I was shown certain trees to which these animals constantly recur for the purpose, as it is said, of sharpening their claws. I saw three well-known trees; in front, the bark was worn smooth as if by the breast of the animal, and on each side there were deep scratches, or rather grooves, extending in an oblique line, nearly a yard in length. The scars were of different ages. A common method of ascertaining if a Jaguar is in the neighbourhood is to examine these trees. I imagine this habit of the Jaguar is exactly similar to one which may any day be seen in the common Cat, as with outstretched legs and exserted claws it scrapes the leg of a chair; and I have heard of young fruit-trees in an orchard in England having been thus much injured. Some such habit must also be common to the Puma, for on the bare hard soil of Patagonia I have frequently seen scores so deep that no other animal could have made them. The object of this practice is, I believe, to tear off the ragged points of their claws, and not, as the Gauchos think, to sharpen them. The Jaguar is killed, without much difficulty, by the aid of Dogs baying and driving him up a tree, where he is despatched with bullets."

It has been stated that great contests take place between the Jaguars and the Alligators which frequent the rivers of the regions in which the great Cat lives. It is said that the Jaguar is fully a match for the Alligator on land, while in the water the reptile has usually the best of it. The tale must, however, be taken *cum grano salis*. A very curious fact is mentioned by Brehm, namely, that the Jaguar always attacks Negroes and Indians in preference to whites, and that a white man, obliged to sleep in the open air in a dangerous locality, always feels perfectly safe if accompanied by natives. It is thought that this is probably due to the strong odour which characterises the skin of the Negro and other dark races. As tending to confirm this extraordinary statement, we may mention an anecdote told us by the late Prof. P. M. Duncan, F.R.S., of the behaviour of the great *Felidæ* at the Zoological Gardens towards coloured people. Every one must have noticed the calm, supercilious, way in which those grand creatures regard the visitors to their abode, seeming to look on them as beings of an inferior race come to pay rightful homage to strength and beauty; except at feeding-time, they seem hardly to give a thought to the admiring crowds in their house of reception, but pace regularly up and down their dens, or sit with paws thrust out between the bars, stolidly gazing. Several years ago, however, when the Prince of Wales's Indian animals were exhibited at the Gardens, a little black boy, one of the attendants attached to the collection, often passed through the Lion-house; and when he did so, every Cat in the place started to its feet, and rushed to the bars of its cage with great demonstrations of anger and ferocity. They evidently felt that here, at least, was one of the black, two-legged animals on which their fathers and grandfathers had fed from time immemorial, and that now was their time to strike for a pleasant change of diet, after the monotony of beef bones, ignominiously cut up and parcelled out to them.

THE PUMA.*

The Puma, or "South American Lion," is the second great American Carnivore. It occurs far more widely spread in the continent than the Jaguar, ranging from the cold regions of the Strait of Magellan up to 50° or 60° north latitude. In appearance it is not unlike a small Lioness, having a tint somewhat similar to the characteristic tawny colour of the monarch of Africa, but darker, greyer, and less rich; the mane, too, is absent. Its head is proportionally, as well as absolutely, much smaller than that of the Lion; its face is rounder, and it is altogether a much smaller beast: its average size being about thirty-nine or forty inches from the snout to the root of the thick, strong tail, the latter again being some twenty-five or twenty-six inches long, and the height about the same. Indistinct spots occur, as in the Lion, on the belly and the inside of the legs. The hind-quarters are very large, and are kept higher than the shoulders in walking. The skin beneath the belly is remarkably loose and pendulous.

* *Felis concolor.*

Unlike the Jaguar, the Puma avoids water, although well able to swim when necessary. It is as much at home in trees as on solid ground, and is a terror to the Capuchin and other Monkeys which abound in the forests of South America. It is, however, a far more cowardly animal than the Jaguar, and is not feared by the natives to anything like the same degree. Mr. Darwin, who had ample opportunity of observing its habits, writes thus of it in his "Naturalist's Voyage":—

"This animal has a wide geographical range, being found from the equatorial forests, throughout the deserts of Patagonia, as far south as the damp and cold latitudes (53° to 54°) of Tierra del Fuego. I have seen its footsteps in the Cordillera of Central Chili, at an elevation of at least 10,000 feet. In La Plata the Puma preys chiefly on Deer, Ostriches, Bizcacha, and other quadrupeds. It there rarely attacks cattle or Horses, and most rarely man. In Chili, however, it destroys other quadrupeds. I heard, likewise, of two men and a woman who had been thus killed. It is asserted that the Puma always kills its prey by springing on the shoulders, and then drawing back the head with one of its paws until the vertebræ break. I have seen, in Patagonia, the skeletons of Guanacos, with their necks thus dislocated.

"The Puma, after eating its fill, covers the carcass with many large bushes, and lies down to watch it. This habit is often the cause of its being discovered; for the Condors, wheeling in the air, every now and then descend to partake of the feast; and being angrily driven away, rise all together on the wing. The Chileno Guaso then knows there is a Lion [Puma] watching his prey; the word is given, and men and Dogs hurry to the chase. Sir F. Head says that a Gaucho in the Pampas, upon merely seeing some Condors wheeling in the air, cried, 'A lion!' I could never myself meet with any one who pretended to such powers of discrimination. It is asserted that if a Puma has once been betrayed by thus watching a carcass, and has then been hunted, it never resumes this habit, but that having gorged itself, it wanders far away. The Puma is easily killed. In an open country it is first entangled with the bolas,* then lazoed, and dragged along the ground till rendered insensible. At Tandil (south of the Plata), I was told that within three months one hundred were thus destroyed. In Chili they are generally driven up bushes or trees, and are then either shot or baited to death by Dogs. The Dogs employed in this chase belong to a particular breed, called 'Leoneros.' They are weak, slight animals, like long-legged Terriers, but are born with a peculiar instinct for this sport. The Puma is described as being very crafty. When pursued it often returns on its former track, and then suddenly making a spring on one side, waits there till the Dogs have passed by. It is a very silent animal, uttering no cry even when wounded, and only rarely during the breeding season."

The comparative silence of the Puma is very noticeable in the specimens at the Zoological Gardens. They never roar like other large Cats, never, in fact, getting beyond a sort of hoarse grunt; but when angry, they spit and "swear" in precisely the same manner as furious Tom Cats. In this respect they differ very markedly from the Lion and Tiger, and agree with the lesser Cats, such as the Ocelot, Serval, Lynx, &c.

The flesh of the Puma is often eaten by the Gauchos. Mr. Darwin, who tried it, pronounced it to be very white, and to taste remarkably like veal. This is a curious circumstance, as the flesh of most Carnivora is anything but palatable. While speaking of the Leopard, we mentioned its curious habit of *squatting* instead of *lying* down to eat, and of only occasionally touching its food with its paws. With the Puma this is still more remarkable; it squats in the same manner as the Leopard, but, although we have watched it many times, we never once saw it use its paws to assist in holding its food. However difficult of manipulation the bone may be, however it may slip about and object to be crunched, it never seems to occur to the animal that he might use his paws to steady it.

In captivity, the Puma, at any rate when caught young, is a tolerably docile animal, and, like the Domestic Cat, is fond of playing with inanimate objects; the Pumas at the Zoological Gardens, for instance, have a large wooden ball as a toy. They do not, however, appear to be always perfectly amiable; the female may often be seen swearing at her lord in a most reprehensible manner.

* A weapon used by the Gauchos, and consisting of three cords, knotted together at one end, and having each a ball or stone attached to the other. The smallest of these is held in the hand, and the Gaucho "whirls the other two round and round his head, then taking aim, sends them like chain shot rushing through the air."

SNOW LEOPARD, OR OUNCE.

(*From the Living Specimen in the Zoological Gardens, London.*)

THE OUNCE.*

The Ounce, or "Snow Leopard," as it is commonly called by sportsmen in the hills, is found throughout the Himalayas at a great elevation, never very much below the snows, at ranges varying with the season from 9,000 to 18,000 feet. It is said to be more common on the Tibetan side of the Himalayas; it is found also throughout the highland region of Central Asia, and extends as far west as Smyrna.

It is about the same size as the Leopard (four feet four inches long, excluding the tail), which it also resembles in habits; in fact, it may be looked upon as a Leopard specially adapted for a cold climate.

OUNCE.

The ground-colour of the skin is pale yellowish-grey, turning beneath to dingy yellowish-white. It is spotted in much the same way as the Leopard, though not so distinctly. "The fur throughout is very dense, and it has a well-marked, though short mane. The face is short and broad, and the forehead much more elevated than in any other Cat."

The Ounce is said to frequent rocky ground, and to kill the Wild Sheep as well as Domestic Sheep, Goats, and Dogs; but it has never been known to attack man.

THE CLOUDED TIGER.†

This animal, which is about intermediate in size between the great Cats, such as the Lion, Tiger, or Leopard, and the lesser kinds, such as the Ocelot, Eyra, or Tiger-Cats, is, as far as the markings of the skin are concerned, one of the most beautiful animals in the whole family. The ground-colour of the skin is not so fine as that of the Tiger, being a light buff instead of a rich orange-tawny, but the large, irregular, cloud-like patches of black are far more exquisite than the parallel bands of the Tiger; and, indeed, the only animal which in any way approaches it in the beauty of its markings is the Ocelot.

* *Felis uncia.* † *Felis macrocelis.*

and from this the Clouded Tiger certainly bears the palm. Its form is not particularly graceful, as its legs are short in comparison with the length of its body, and its snout, though longer than that of most Cats, is blunt and somewhat awkward. One of the chief beauties of this creature, however, is its magnificent tail, which is fully four-fifths the length of the body (the latter being some forty inches long), and handsomely ringed with black. The skull is much elongated, especially its facial portion, and bears a strong resemblance to that of the extinct *Felis smilodon*. The pupil is oblong and erect, not round, as in all the preceding species.

The Clouded Tiger, or *Rimau Dahan*, is found in Siam, Assam, Borneo, Java, Sumatra, and the Malayan Peninsula. It was first introduced to Great Britain by Sir Stamford Raffles, who brought two specimens with him to England, of which he gives the following interesting account:—

CLOUDED TIGER.

"Both specimens above mentioned, while in a state of confinement, were remarkable for good temper and playfulness; no domestic kitten could be more so. They were always courting intercourse with persons passing by, and in the expression of their countenance, which was always open and smiling, showed the greatest delight when noticed, throwing themselves on their backs, and delighting in being tickled and rubbed. On board the ship there was a small Musi Dog, who used to play round the cage and with the animal, and it was amusing to observe the playfulness and tenderness with which the latter came in contact with his inferior-sized companion. When fed with a fowl that had died, he seized the prey, and after sucking the blood and tearing it a little, he amused himself for hours in throwing it about and jumping after it in the manner that a Cat plays with a Mouse before it is quite dead. He never seemed to look on man or children as prey, but as companions, and the natives assert that when wild they live principally on poultry, birds, and the smaller kind of deer. They are not found in numbers, and may be considered rather a rare animal, even in the southern part of Sumatra. Both specimens were procured from the interior of Bencoolen, on the banks of the Bencoolen River. They are generally found in the vicinity of villages, and are not dreaded by the natives, except as far

as they may destroy their poultry. The natives assert that they sleep and often lie in wait for their prey on trees; and from this circumstance they derive the name of *Dahan*, which signifies the fork formed by the branch of a tree, across which they are said to rest, and occasionally stretch themselves.

"Both specimens constantly amused themselves in frequently jumping and clinging to the top of their cage, and throwing a somerset, or twisting themselves round in the manner of a Squirrel when confined, the tail being extended and showing to great advantage when so expanded."

Besides the localities we have mentioned, the Clouded Tiger is described by Consul Swinhoe as existing in Hainan, and he gives a curious quotation respecting the animal from a native paper, the *Hainan Gazetteer*:—"Pao, or Leopard, resembling a Tiger in form, with white fur and round head.

OCELOT.

Those with spots like cash (Chinese coin) are called the 'Golden-cash Leopard' (*Felis pardus*). Those with spots shaped like the mint leaf are called Mint Leopard (*F. macrocelis*). They dread Snakes. Hwai Nantzse has the following couplet:—'Snakes command the Leopard to stand: all creatures have their masters.'"

There was in 1876 a fine specimen in the Zoological Gardens, but it was not always to be seen, as it was kept during the day fastened up in one of the little sleeping apartments at the back of a cage in the Lion-house, and was let out only for about half an hour before the Gardens closed. It was well worth stopping to see. As soon as the iron door of its cell was raised, it would come out into the large cage with a peculiarly sailor-like slouch, for owing to the shortness of its legs its gait was quite different to that of an ordinary Cat, and altogether less elegant. The expression of the face, too, was neither savage, nor majestic, nor intelligent, but rather dull and stupid. It was fond of assuming all sorts of queer attitudes. Brehm describes one as lying prone on a thick branch placed in its cage, with all four legs hanging down straight, two on each side of the branch, certainly a remarkable position for an animal to assume of its own free will.

THE OCELOT.*

This extremely beautiful Cat (see previous page) is, like the Jaguar and the Ounce, a native of America, where it is found throughout the central part of the Continent, from Mexico and Texas on the north, to the northern boundaries of Brazil on the south. Its musical name was coined by Buffon as an abbreviation of its native Mexican appellation Thaloeelotl.

The grey or tawny skin is marked by broadly-sweeping rows of longitudinally elongated spots of large size, each consisting of a black rim enclosing an area somewhat darker than the general ground tint. The head is also beautifully striped, and the tail ringed with black. Altogether, the

MARBLED TIGER-CAT.

Ocelot is, in the matter of markings, second only to the Clouded Tiger. It is about four feet long from the snout to the tip of the tail, and its legs are rather short for its size.

"It is a very voracious animal, but at the same time timid. It rarely attacks men. It is afraid of Dogs, and when pursued it makes off to the woods and climbs a tree. There it remains, and even takes up its abode to sleep and look out for game and cattle, upon which it darts as soon as they are within range. It prefers the blood to the flesh, and, in consequence, destroys a vast number of animals, for instead of devouring them, it only quenches its thirst by sucking their blood."†

Notwithstanding its cowardice, the Ocelot is a very savage animal. Buffon mentions a pair of young ones in captivity, which, at the age of three months, were sufficiently strong and cruel to kill and devour a bitch who had been given them as a nurse. He further adds the curious fact, that the male always kept the female in wonderful subjection, so much so, that she was afraid even to attempt to eat until he was completely satisfied.

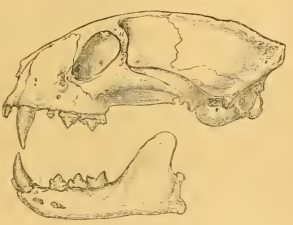
* *Felis pardalis.* † Buffon.

THE MARBLED TIGER-CAT.*

"This prettily-marked Wild Cat (see previous page) has been found in the Sikkim Himalayas, in the hilly regions of Assam, Burmah, and Malaysia, extending into the islands of Java, at all events." The head and body together are from eighteen and a half to twenty-three inches long, the tail fourteen to fifteen and a half inches. The ground-colour of its hide is of a dingy tawny, "occasionally yellowish-grey, the body with numerous elongate wavy, black spots, somewhat clouded or marbled." The tail is spotted and tipped with black, and the belly is yellowish-white.

THE VIVERRINE CAT. †

"This large Tiger-Cat," says Mr. Jerdon, "is found throughout Bengal, up to the first of the South-eastern Himalayas, extending into Burmah, China, and Malaysia. I have not heard of its occurrence in Central India, nor in the Carnatic; but it is tolerably common in Travancore and Ceylon, extending up the Malabar coast as far as Mangalore. I have had one killed close to my house at Tellicherry. In Bengal it inhabits low, watery situations chiefly, and I have often got it upon the edge of swampy thickets in Purneah. It is said to be common in the Terai and marshy regions at the foot of the Himalayas, but apparently not extending further west than Nepaul. Buchanan Hamilton remarks, 'In the neighbourhood of Calcutta it would seem to be common. It frequents reeds near water; and, besides fish, preys upon *Ampullinæ*, *Unios* (shell-fish), and various birds. It is a furious untamable creature, remarkably beautiful, but has a very disagreeable smell.' On this Mr. Blyth observes, 'I have not remarked the latter, though I have had several big toms quite tame, and even found this to be a particularly tamable species. A newly-caught male killed a tame young Leopardess of mine about double his size.' The Rev. Mr. Baker, writing of its habits in Malabar, says that it often kills Pariah Dogs; and that he has known instances of slave children (infants) being taken from their huts by this Cat: also young calves."



SKULL OF VIVERRINE CAT.

* The bony bar formed by the union of the frontal and jugal bones which completes the orbit behind.

Notwithstanding its ferocity this is by no means a large animal, being only thirty to forty-four inches long, without the tail, which is ten and a half to twelve and a half inches in length. "The ears are rather small and blunt; the pupil circular; the fur coarse and without any gloss; the limbs short and very strong." The snout is narrow, and drawn out like that of a Civet, hence the name *Viverrina*. The colour is grey, lighter beneath, and banded and spotted with black. There is a very noticeable peculiarity in the skull, from the fact that the orbit, or bony cavity in which the eye is lodged, is completed behind by bone, a character quite exceptional among Cats, and indeed among Carnivora generally.

A very fine specimen was brought over by the Prince of Wales after his visit to India, and deposited in the Zoological Gardens in Regent's Park.

THE PAMPAS CAT. ‡

This animal, as its name implies, is found on the Pampas of South America, extending as far south as the Strait of Magellan, and being especially abundant in the region of the Rio Negro. It is about forty inches long, with a shortish tail and long fur: the hairs, indeed, sometimes attain a length of four or five inches. "The colour of the skin is a pale yellowish-grey, traversed by regularly disposed yellow or brown bands, which run obliquely from the back and the flanks. The

* *Felis marmorata.* † *Felis viverrina.* ‡ *Felis pajeros.*

hairs, considered separately, are brown at the root, then yellow, and finally black at the point, but those of the hinder part of the back are black at the root, then grey, then yellowish-white, and finally white up to the point, which is black."

The Pampas Cat is a comparatively harmless beast, not preying upon poultry-yards, but confining itself to the small Mammals which abound in the South American steppes.

THE LONG-TAILED TIGER-CAT.*

This little-known form—the "Ocelot Leopard" as it is sometimes called—was discovered by Prince Maximilian of Neuwied, in Brazil, where it inhabits the great forests, and is often killed for the sake of its beautiful fur. In colour it is not unlike the Ocelot, in size it is inferior to it, and its longitudinally elongated spots are neither so large nor so well marked. It is chiefly distinguished from other forms by its long bushy tail, and its big staring eyes. It is considerably smaller than the preceding species, the body being about twenty-seven inches long, the tail fourteen.

LONG-TAILED TIGER-CAT.

THE MARGAY.†

This is also an American species, being found in Brazil and Guiana, where it is often known as the "Tiger-Cat." It is much smaller than the Ocelot—little larger than the Domestic Cat, in fact—the body being about twenty-three inches long, and the tail thirteen, and resembles the Ocelot in general appearance (see next page). Its spots are, however, smaller, and more regularly arranged, so that it is by no means so handsome an animal as *F. pardalis*.

It lives in the woods, and destroys an immense amount of small game and birds. It is a savage beast, but is capable of domestication, and may be put to good use as a mouser; it can never, however, be quite trusted, and always keeps up a more or less ferocious appearance. Still, it must be remembered that, in common with a large proportion of the wild *Felidæ*, it has never had a fair chance of showing its milder virtues. The Cats, almost without exception, are savage in the extreme, and practically untamable when caught in the adult state, but Mr. Bartlett informs us that there is hardly one of the group that may not be thoroughly domesticated, if taken young and properly treated.

THE COLOCOLO.‡

This is another Central American Tiger-Cat, of equal ferocity with the last, but far less beautiful. The fur is rougher; the ground-colour is tawny; the spots are smaller than in the Ocelot,

* *Felis macrura.* † *Felis tigrina.* ‡ *Felis ferox.*

and not so exquisitely arranged. The whole body is some forty-one inches long, of which the tail takes up about fourteen.

The Colocolo is an extremely ferocious animal, and does great harm in the forests in which it lives, where, amongst other things, it feeds largely on Monkeys. "On the banks of a river in Guiana, an officer, having killed one of these Cats, stuffed it, and placed it to dry in the hinder part of the boat in which he was travelling. One day they passed under some great trees, the branches of which, hanging into the water, formed a resting-place for innumerable Monkeys, which approached the boat with great curiosity, and seemed to take pleasure in following it as far as the trees would permit. On this particular voyage, the Monkeys ran towards the boat as usual, but the sight of the stuffed fur inspired them with such terror that they precipitately took flight, uttering cries of rage and terror.

MARGAY.

This observation shows clearly enough that Monkeys look upon the Colocolo as one of their most terrible enemies." *

THE JAGUARONDI.†

This is a curious, long-bodied, short-legged animal (see next page), with a body almost as lithe and lissom as a Weasel's. Like the Puma's, its head is small and well shaped, and its tail long; but it is a much smaller animal, not exceeding three feet in length, including the tail. Its colour is a dark grey-brown, "each hair being greyish-black, very dark at the root, and entirely black between the root and the point, which is of a dark-grey hue. This diversity of colour causes the Jaguarondi to appear darker or lighter according to circumstances," that is, according to whether, being in a placid condition, his hair is lying smooth and flat on the body, or whether, being excited, he erects it.

The Jaguarondi lives in the thick forests of Brazil, Paraguay, and Guiana, where it always prefers the most impenetrable thickets, and is never seen in the open country. It lives upon birds and small Mammals, having a special fondness for fowls, which no amount of training will ever diminish. Even when a domesticated Jaguarondi is chained up in a yard, it will "try a thousand shifts" to entice the fowls into its neighbourhood, and will then suddenly leap on and devour them.

* Brehm. † *Felis jaguarondi.*

THE EYRA.*

This is by far the most beautiful of all the smaller one-coloured Cats (see next page). The beauty of its rich chestnut hide, and the extreme elegance of its form, quite incline one to assign to it the palm for beauty, even in presence of such splendidly-marked forms as the Ocelot. The specimen in the London Zoological Gardens is a most delightful animal. It is slightly smaller than an ordinary Cat, and much less in height, owing to the shortness of its legs, in comparison with which the body is of great length ; so that one at first sight instinctively compares it with a Weasel, to which, however, it has really no relationship whatever. Its neck is long, its head small, and curiously flattened from above downwards, almost like an Otter's, and its tail long and well shaped. Its movements are almost

JAGUARONDI.

Snake-like, so continuously does it twist and turn its long lithe body. In its sanguinary habits and mode of life it does not differ in any important respect from the Jaguarondi, with which it also agrees in its geographical distribution. It is, however, a much rarer animal.

Mr. Bartlett informs us that he has kept the Eyra in his house, and that it made a most charming pet. Brehm also mentions two domesticated individuals which were on very good terms with the Cats and Dogs in the house, and were particularly friendly with a Monkey, who did them the kind office of catching their fleas.

THE SERVAL.†

The Serval, or African Tiger-Cat, is found over the greater part of Africa, being specially abundant in the south, but extending also as far north as Algeria. It especially frequents the extensive grassy plains or steppes, where it lives upon Antelopes and other game.

Its legs are proportionally much longer and the tail much shorter than those of most of the true

* *Felis eyra.* † *Felis serval.*

Cats, in which respects it approaches the Lynxes. It is distinguished from these, however, by the absence of tufts of hair on the ears. The body is about forty inches in length, the tail about sixteen inches. This, it will be seen, by a comparison with the dimensions given of the preceding kinds, shows a much smaller proportion between the tail and the body than in most of the true Cats, but the appendage is never as short as in a Lynx. The ground-colour of the skin is tawny, lighter or darker according to circumstances, and spotted with black. The spots on the flank are all elongated longitudinally, and, along the back, run into distinct bands which are continued on to the forehead. This running together of spots into longitudinal stripes is very common in the Cat tribe. The tail is regularly ringed with black. The fur, although coarse, is handsome, and much used.

EYRA.

THE RUSTY-SPOTTED CAT.*

Mr. Jerdon says, "This very pretty little Cat frequents grass in the dry beds of tanks, brushwood, and occasionally drains in the open country and near villages, and is said not to be a denizen of the jungle. I had a kitten brought over when very young, and it became quite tame, and was the delight and admiration of all who saw it. Its activity was quite marvellous, and it was very playful and elegant in its motions. When it was about eight months old, I introduced it into a room where there was a small fawn of the Gazelle, and the little creature flew at it the moment it saw it, seized it by the nape, and was with difficulty taken off." There is something marvellous in this destroying instinct. This kitten had, probably, never seen a Gazelle before in the whole course of its short life, but it at once recognised its prey, and all the savagery of its long line of ancestors was concentrated in the spring which landed it on the unlucky Gazelle's neck.

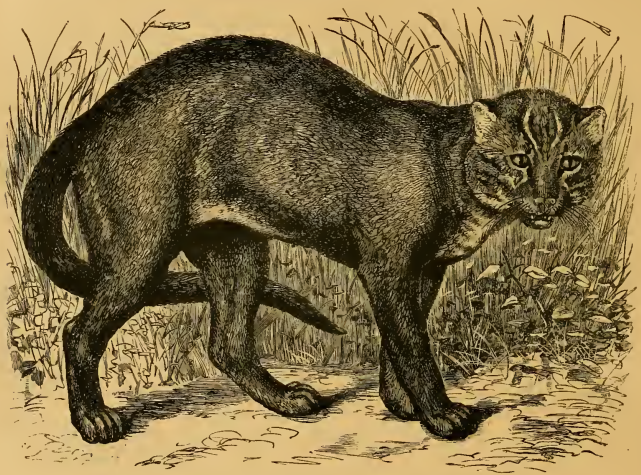
The head and body of this species are together sixteen to eighteen inches long; the tail, nine inches

* *Felis rubiginosa.*

and a half. The short, soft fur is a greenish-grey, with a faint rufous tinge, and marked with rusty-coloured spots, roundish on the sides, but, as usual, becoming elongated in the direction of the animal's length, on the back. It is found in the Carnatic, and in the southern parts of Ceylon.

THE LEOPARD CAT.*

This is another of the numerous Indian Cats, and is a very beautiful species. Its hide is of a yellowish-grey, or bright tawny hue, quite white below, and marked with longitudinal stripes on the head, shoulders, and back, and with large irregular spots on the sides, which become rounded towards the belly. The tail is a spotted colour, indistinctly ringed towards the tip. The body, from the end of



BAY CAT.

the snout to the tip of the tail, attains a length of from thirty-five to thirty-nine inches, eleven or twelve of which are made up by the tail.

"The Leopard Cat is found throughout the hilly region of India, from the Himalayas to the extreme south, and Ceylon, and in richly-wooded districts, at a low elevation occasionally, or when heavy jungle grass is abundant, mixed with forest and brushwood. It ascends the Himalayas to a considerable elevation, and is said by Hodgson even to occur in Tibet, and is found at the level of the sea in the Bengal Sunderbunds. It extends through Assam, Burmah, the Malayan peninsula, to the islands of Java and Sumatra, at all events." †

It is as fierce as any of its savage kin. "A shikarie declared that it drops on large animals, and even on Deer" (remember that the animal is only two feet long!) "and eats its way into the neck; that the animal in vain endeavours to roll or shake it off, and at last is destroyed." In confinement it is extremely savage, and, curiously enough, "it never paces its cage for exercise during the daytime, at least, but constantly remains crouched in a corner, though awake and vigilant."

* *Felis bengalensis.* † Jerdon.

THE BAY CAT.*

This animal (see figure on previous page) is found on the Gold Coast of Africa, as well as in Nepaul, Sumatra, and Borneo. It is of a deep bay-red colour above, becoming paler below: there are a few indistinct dark spots on the hind legs, and the head is splendidly ornamented with stripes of black, white, and orange, offering a striking contrast to the uniform tint of the body, and reminding one strongly of the Tiger. The head and body measure about thirty-one inches, the tail nineteen inches.

Unfortunately nothing is known of the habits of this Cat, so that we can only assume that it has the same savage nature and untamable disposition as the members of its family most nearly allied to it.

THE SPOTTED WILD CAT.†

The habits of this Indian species differ a good deal from those of most Wild Cats, for instead of living in forests and jungles, it frequents "open, sandy plains, where the Field Rat must be its principal food. I hardly ever remember seeing it in what could be called jungle, or even in grass." ‡

It is of a grey colour, spotted with black, and attains a length of sixteen to eighteen inches, not including the tail, which measures ten or eleven inches more. The ears are of a dull-reddish colour, and have a small tuft of hair on the tip, thereby showing a relationship between this Cat and the Lynxes.

THE MANUL.§

The Manul seems to replace the common Wild Cat in Northern Asia, where it occurs on the steppes of Tartary and Siberia. It was discovered by Pallas, who gives no account of its habits.

Its body is twenty-eight, its tail twelve inches long, so that it is about the same length as the Wild Cat; it has, however, longer legs. The skin contains a mixture of yellowish and of white hairs; the head is striped, and the tail ringed with black.

THE EGYPTIAN CAT.‖

This is an animal (see figure on next page) of great historic interest, as its remains have been found embalmed in the Egyptian monuments. At the present day it is found in Abyssinia and Egypt.

It is about the size of an average Domestic Cat, but has a longer tail. The general colour is light tawny or yellowish-grey, with dark transverse bands. The tail is tawny above, white below, and ringed only at the termination.

THE COMMON WILD CAT.¶

The Wild Cat exists in "all the wooded countries of Europe, Germany especially, Russia, Hungary, the North of Asia, and Nepaul. This animal is larger in cold climates, and its fur is there held in high estimation. In Britain it was formerly plentiful, and was a beast of chase, as we learn from Richard the Second's Charter to the Abbot of Peterborough, giving him permission to hunt the Hare, Fox, and Wild Cat. The fur in those days does not seem to have been thought of much value, for it is ordained in Archbishop Corboyl's canons, A.D. 1127, that no abbess or nun should use more costly apparel than such as is made of Lambs' or Cats' skins.

"The Wild Cat is now rarely found in the South of England, and even in Cumberland and Westmoreland its numbers are very much reduced. In the North of Scotland and Ireland it is still abundant."

The average length of a full-grown male specimen is, from snout to root of tail, about twenty-eight inches, the tail itself measuring about thirteen inches. The soft thick fur is of a grey colour, inclining to yellowish on the face, and being nearly white on the belly. There is a black band along the middle of the back, from which numerous dark-grey bands proceed in a transverse direction like the hoops of a barrel, gradually dying away as they reach the belly. The thick tail is ringed with grey and black.

"The Wild Cat leads a solitary life; at most, two individuals are seen together. It even appears that the occupant of one district prevents access to it of any others. Its life is completely nocturnal,

* *Felis aurata.* † *Felis torquata.* ‡ Scott, quoted by Jerdon. § *Felis manul.*
‖ *Felis maniculata.* ¶ *Felis catus.*

and has much analogy with that of the Lynx and of our own Domestic Cat. It climbs well, and mounts trees, either as a resting-place, or to escape from an enemy when there is no hole in which it can hide. Under this circumstance it 'plays 'possum' to the best of its ability, keeping close to a large branch, the colour of which, harmonising with that of its skin, contributes to conceal it from view. It does not commence its hunting operations until night has set in; and, in surprising the bird in its nest, the sitting Hare, the Rabbit in its burrow, and even the Squirrel on its tree, it displays a cunning unsurpassed by any of its tribe. When the quarry is a small animal, it leaps on its back and severs its carotids with its sharp teeth. It never pursues an animal which it has failed to reach at the first onslaught, but prefers to go in search of new prey; in a word, it has all the characters of a true Cat.

EGYPTIAN CAT.

Happily for hunters, its principal nutriment consists of Mice and small birds. It is only by accident that it seeks for larger animals; it is, however, certain that it sometimes attacks Fawns or small Roes. It keeps watch by the banks of lakes and streams for fish and birds, both of which it knows full well how to seize. It is extremely destructive in parks, and, above all, in covers, which it utterly depopulates in a very short time. Considering its size, the Wild Cat is a very dangerous Carnivore, its sanguinary nature inciting it to kill far more animals than it can possibly eat. For this reason all hunters detest it, and pursue it with perfect hatred. But no one seems to remember the services it renders to man in destroying small Rodents, and yet these services are undoubted. Tschudi relates that the remains of twenty-six Mice have been found in the stomach of a single individual of this species."*

This interesting account shows how little difference there is between the habits and the nature of this little wild beast of Great Britain and its big cousins of the African and Indian jungles. In its nocturnal habits, its mode of attack, its bloodthirstiness, and its wanton cruelty, it is just the Tiger over again on a small scale, only less harmful because less powerful. Some idea of its immense strength may be gathered from the fact that it is known to have actually killed men.

* Brehm.

In some places the Wild Cat is regularly hunted, usually in winter, when the tracks in the snow are easily followed. The sport has the necessary element of danger to no ordinary degree, for the terrible little beast, if wounded, makes straight for the hunter, and attacks him with tooth and claw, and such teeth and such claws are by no means pleasant things to be wounded with. On the whole, we have hardly reason to be sorry that the race is almost extinct in Great Britain.

THE DOMESTIC CAT.*

This animal—*the* Cat *par excellence*—is, next to the Dog, the flesh-eater which possesses for us the greatest personal interest, as it is, with the exception of the Dog, almost the only quadruped

COMMON WILD CAT.

regularly admitted into the society of man, eating from his hand, drinking from his cup, and being to him, if not a firm friend, like its canine relative, at least a comfortable, contented companion, adding greatly by its look of calm repose and its contented purr to the cosiness of the fireside.

The origin of the Domestic Cat is so far distant that it is quite uncertain from what wild species it was derived. It is not once mentioned in the Bible, a very curious circumstance, as it was well known in Egypt, and it might have been expected that it would be named, with the Dog, among the unclean animals. Cats "are mentioned in a Sanskrit writing 2,000 years old, and in Egypt their antiquity is known to be even greater, as shown by monumental drawings and their mummied bodies." From many circumstances it seems probable that the Cat had, like the Dog, a multiple origin, that is, was produced by the commingling of several wild forms. It is certain that our Domestic Cats will breed freely with many of their feral brethren, such as the Common Wild Cat, the Chaus, Viverrine, and Rusty-spotted Cats, &c.

Wherever the Cat is found as a domesticated animal it is held in great esteem. This feeling was carried to its greatest extent by the ancient Egyptians, whose devotion to their pets was such that, according to Herodotus, when a fire broke out, they cared for nothing but the safety of their Cats, and were terribly afflicted if one of them fell a victim to the flames. On the death of a Cat, the

* *Felis domestica.*

inhabitants of the house shaved off their eyebrows, and the deceased animal was embalmed, and buried with great solemnity in a sacred spot. Many Cat mummies have been found in the Egyptian tombs, and some are to be seen in the British Museum, together with similarly preserved specimens of human beings, and of sacred Calves. Some individuals were wrapped separately in ample bandages covered with inscriptions; others of a less degree of sanctity were preserved in numbers with a single wrapping for several. Their movements and their cries were consulted as oracles, and the murder, or even the accidental felicide of one of them, was punished by death.

TEETH OF DOMESTIC CAT.

MUMMY OF EGYPTIAN CAT.

The earliest account of the Cat in Britain is as far back as A.D. 948. "That excellent prince *Howel Dha*, or *Howel the Good*, did not think it beneath him, among his laws relating to the prices, &c., of animals, to include that of the Cat, and to describe the qualities it ought to have. The price of a kitling, before it could see, was to be a penny; till it caught a Mouse, twopence. It was required, besides, that it should be perfect in its senses of hearing and seeing, be a good mouser, have the claws whole, and be a good nurse; but if it failed in any of these qualities, the seller was to forfeit to the buyer the third part of its value. If any one stole or killed the Cat that guarded the prince's granary, he was to forfeit a milch ewe, its fleece, and lamb, or as much wheat as, when poured on the Cat, suspended by its tail (the head touching the floor), would form a heap high enough to cover the tip of the former. This last quotation is not only curious as being an evidence of the simplicity of ancient manners, but it almost proves to demonstration that Cats are not aborigines of these islands, or known to the earliest inhabitants. The large prices set on them, if we consider the high value of specimens at that time, and the great care taken of the improvement and breed of an animal that multiplies so fast, are almost certain proofs of their being little known at that period."* Moreover, as the Wild Cat was abundant in Britain at this or at more recent periods, it is tolerably certain that this species is not the parent of our domestic kinds.

Little need be said about the anatomy of the Cat, for it differs but slightly from its larger relatives, and hardly at all from the smaller wild species. The skull is smooth, and has its ridges less developed than in the great beasts of prey; the orbits are very large, and the nose-region is extremely short, and forms a continuous curve with the forehead. Owing to these two latter circumstances the Cat is extremely round-faced, more so, perhaps, than any other species of the genus.

SKELETON OF DOMESTIC CAT.

One curious point of structure is to be found in the intestines, which "are wider, and a third longer, than in Wild Cats of the same size." There can be little doubt that this has been brought about by the fact that the food of a domesticated flesh-eater is certain to be somewhat miscellaneous, and not of the strictly carnivorous nature preferred by the animal in its wild state.

The varieties in colour exhibited by the Cat are very great, and often kittens in the same litter

* Pennant, "British Zoology."

will differ greatly in this respect. "The normal colour," according to Dr. Gray, "seems to be that of the Tabby Cat, grey, with black dorsal streaks and sub-concentric bands on the sides and thighs; sometimes all black from melanism, or grey, blue, yellow, or white, or these colours more or less mixed. When black, white, and yellow, it is called Tortoiseshell, or Spanish Cat. The fur varies greatly in length; it is very short, close, and almost erect from the skin in the Rabbit Cats. It is very long, silky, and fluffy in the Angora (or Angola) Cat. The tail is usually long. It is very short or almost entirely wanting in the Isle of Man Cats, or the Japan Cats of Kæmpfer. The ears are generally erect; but they are sometimes pendulous in the Chinese Cats."

With regard to the colour of Cats, a very curious circumstance has been observed, namely, that White Cats with blue eyes are nearly always deaf! The only rational explanation of this remarkable phenomenon is that suggested by Mr. Wallace, namely, that the absence of colour in the skin is usually accompanied by a similar absence of pigment elsewhere, and it has been shown that the presence of a peculiar black pigment is very essential to the proper action of the sense organs. To bear out this view it may be stated that *Albinos*—that is, abnormally colourless animals—are usually deficient in taste, smell, and sight.

The eye also varies much in colour, being blue, yellow, or green. The pupil, or small black aperture in the centre of the coloured portion, is extremely sensitive, dilating greatly in the dark, and contracting to a mere line when the light is strong.

We have already mentioned the skin-muscle, or thin band of flesh lying immediately under the skin, and by means of which the shivering of the skin, the erection or rendering vertical of hairs, &c., is performed. The latter effect—an effect seen on a small scale in ourselves as "goose-skin"—is well seen in the Cat, for the animal invariably makes its hair stand on end when it is angry or alarmed, and so makes itself look as large and terrible as possible. In the manner of using this muscle, as well as in many other matters, the Cat resembles in a remarkable degree the great beasts of prey, and forms a capital study of feline expression. Every one must have noticed the instantaneous change in the whole demeanour of a Cat when it catches sight of a strange Dog. This and other characteristic attitudes are well described by Mr. Darwin.*

"When this animal is threatened by a Dog it arches its back in a surprising manner, erects its hair, opens its mouth, and spits." This well-known attitude "is expressive of terror combined with anger. Anger alone is not often seen, but may be observed when two Cats are fighting together; and I have seen it well exhibited by a savage Cat whilst plagued by a boy. The attitude is almost exactly the same as that of a Tiger disturbed, and growling over its food, which every one must have beheld in menageries. The animal assumes a crouching position, with the body extended; and the whole tail, or the tip alone, is lashed or curled from side to side. The hair is not in the least erect. Thus far, the attitude and movements are nearly the same as when the animal is prepared to spring on its prey, and when, no doubt, it feels savage. But when preparing to fight, there is this difference, that the ears are closely pressed backwards; the mouth is partially opened, showing the teeth; the fore-feet are occasionally struck out with protruded claws, and the animal occasionally utters a fierce growl. Let us now look at a Cat in a directly opposite frame of mind, whilst feeling affectionate and caressing her master, and mark how opposite is her attitude in every respect. She now stands upright with her back slightly arched, which makes the hair appear rather rough, but it does not bristle. Her tail, instead of being extended and lashed from side to side, is held quite stiff and perpendicularly upwards; her ears are erect and pointed; her mouth is closed, and she rubs against her master with a purr instead of a growl. Let it further be observed how widely different is the whole bearing of an affectionate Cat from that of a Dog, when, with his body crouching and flexuous, his tail lowered and wagging, and ears depressed, he caresses his master.

"We can understand why the attitude assumed by a Cat when preparing to fight with another Cat, or in any way greatly irritated, is so widely different from that of a Dog approaching another with hostile intentions; for the Cat uses her fore-feet for striking, and this renders a crouching position convenient or necessary. She is also much more accustomed than a Dog to lie concealed and suddenly spring on her prey. No cause can be assigned with certainty for the tail being lashed or curled from

* "Expression of the Emotions in Man and Animals."

side to side. This habit is common to many other animals, for instance, to the Puma, when prepared to spring; but it is not common to Dogs or to Foxes."

Under ordinary circumstances, when neither attacking a foe nor caressing a friend, the Cat is the very image of lazy content. As she sits by the fire, softly purring, and occasionally licking her paws and rubbing them over her face, she seems an embodiment of repose, an incarnation of *otium cum dignitate*, a standing discourse on the advisability of

"Holding it ever the wisest thing
To drive dull care away."

But notwithstanding its usual indolence, the Cat, like all its congeners, is capable of very violent action upon occasions. This is more especially the case with kittens, who are, perhaps, the

DOMESTIC CAT.

most delightful of all young animals: the most elegant, the most active, the most restless, the most overboiling with life and spirits. Who has not watched a kitten play? No matter what its toy may be; it is content with anything movable—a ball, a piece of string, a lady's dress, the fallen leaves in the garden—anything and everything she will play with, and as she plays, "grace is in all her steps," every movement of her head, every pat of her velvet paw, every whisk of her little tail, is elegance itself. Even in the old Cat this wonderful power of executing the most rapid movements with almost the quickness of thought is rather in abeyance than actually absent; she can still run, leap to many times her own height, climb a tree or a vertical wall by means of her sharp claws, and perform other marvellous gymnastic feats impossible to anything else but a Squirrel or a Monkey.

The sense which of all others is most deficient in the Cat is that of smell. In this she differs most markedly from the Dog. It is said that a piece of meat may be placed in close proximity to a Cat, but that, if it is kept covered up, she will fail to distinguish it. This want is, however, partly

compensated for by an extremely delicate sense of touch, which is possessed, to a remarkable extent, by the whiskers, or vibrissæ, as well as by the general surface of the skin. These bristles, as we have already mentioned in speaking of the Tiger, are possessed to a greater or less extent by all

ANGORA KITTENS.

Cats, and are simply greatly developed hairs, having enormously swollen roots, covered with a layer of muscular fibres, with which delicate nerves are connected. By means of these latter, the slightest touch on the extremity of the whiskers is instantly transmitted to the brain. These organs are of the greatest possible value to the Cat in its nocturnal campaigns. When it is deprived of the guidance afforded by light it makes its way by the sense of touch, the fine whiskers touching against every object the Cat passes, and thus acting in precisely the same manner as a blind man's stick, though

with infinitely greater sensibility. Imagine a blind man with not one stick, but a couple of dozen, of exquisite fineness, and these not held in his hand, but embedded in his skin, so that his nerves come into direct contact with them instead of having a layer of skin between, and some notion may be formed of the way in which a Cat uses its whiskers.

But the Cat in its night walks has a further advantage over the blind man, namely, that except on the very darkest nights, it is not entirely deprived of the power of sight, for, as we have already mentioned, the pupil is so constructed that in the dark it can be dilated, so as to catch every available ray of light, and, moreover, the *tapetum*, or brilliant lining of the eyeball, reflects and magnifies the straggling beams, and so enables the Cat, if not actually to "see in the dark," as is sometimes stated, at least to distinguish objects in an amount of light so small as to be inappreciable to our duller vision.

As we have already mentioned, the Domestic Cat is less strictly carnivorous than the wild *Felidæ*: still it prefers meat or milk to anything else, and is by no means a miscellaneous feeder, like the Dog. In the matter of diet, Gilbert White remarks*—"There is a propensity belonging to common house Cats that is very remarkable. I mean their violent fondness for fish, which appears to be their most favourite food; and yet Nature in this instance seems to have implanted in them an appetite that, unassisted, they know not how to gratify; for, of all quadrupeds, Cats are the least disposed towards water, and will not, when they can avoid it, deign to wet a foot, much less to plunge in that element." Mr. White does not seem to have known of the habits of the Jaguar.

A curious instance of the selection of their food by Cats and Dogs is given by the same author:—"As my neighbour was housing a rick, he observed that his Dogs devoured all the little red Mice that they could catch, but rejected the common Mice; and that his Cats ate the common Mice, refusing the red."

This may be partly accounted for by the fact that the little Harvest Mouse has scarcely any trace of the odour which makes the domestic kind disagreeable, and which odour is not disliked, or perhaps is hardly perceived, by the Cat. Both Dogs and Cats, when the corn-ricks are being housed for threshing, will go on helping the farmer and his men for hours, killing Mice by hundreds and by thousands long after they have been satiated by eating them. These Mouse *battues* illustrate the intelligence of the Cat as well as of the Dog, in a quick understanding of what relates to their own interest; for they know immediately what the removal of the thatch from the rick means, and, as it were, scent their prey before it is unearthed. Yet the food-treasures in these ricks are not unknown to the Cats, who night by night for months, perhaps, have caught and regaled themselves upon stragglers from the swarm.

But although of most domestic Cats it may be said,

> "Rats and Mice, and such small deer,
> Have been *Tom's* food for many a year,"

yet, in districts that have the game well "preserved," this sort of diet is often exchanged for that of nobler prey, and the tame Cat will stray for months from the homesteads for young Rabbits, Leverets, and the Partridge covey. This poaching is almost sure to end in death, as these Cats are closely watched by the keepers.

One curious thing about these poaching habits is that they run in families. As Mr. Darwin says, one Cat "naturally takes to catching Rats, and another Mice, and these tendencies are known to be inherited. One Cat, according to Mr. St. John, always brought home game birds, another Hares or Rabbits, and another hunted on marshy ground, and almost nightly caught Woodcocks or Snipes."

A Cat who has once taken to habits like these soon loses her taste for human society and a comfortable fireside, and becomes quite wild and almost as untamable as one of the actually feral species. Many years ago, in a village where we were then living, a female half-wild Cat made furtive visits to an old and extensive farmstead for the sake of the dove-cot Pigeons, and for the safer rearing of her young. These she would deposit, not in-doors, like our tame, pet Cats, but generally in the fagot-stack, and once in a corner of the thick house-thatch, in which was a labyrinth of passages made

* "Natural History of Selborne."

by the grey Rat. This Cat would form no friendship with us, but made almost demoniacal demonstrations of her combined hatred and fear. Her swearing and her spitting were accomplishments learned by her kittens as soon as they could see, and no care of ours could tame them.

One of the most remarkable things about the Cat is its habit of always burying its excrement, whether solid or liquid. A Cat living in the house is easily trained to leave the premises for this purpose, and will always be found to cover her droppings with earth; but even young, untrained Cats of dirty habits, who cannot be kept from occasionally defiling the house, will invariably try to hide their sin by scraping up cinders, &c., over it, or will, at any rate, make vigorous scratches at the carpet, in their endeavours to get up some of it for the same purpose. How a habit of this sort can have originated in an animal living in the woods, as do all the Cats when in a wild state, is a puzzle.

Like most of the Carnivora, the Cat is a tender and affectionate mother; the care with which she trains her young ones, her anxiety for their comfort, her industry in washing them, are too well known to require remark. So fond is she of her offspring that she will entirely alter her usual habits to regain lost ones. Mr. Hugh Miller, F.G.S., tells us of a Cat belonging to a clergyman in Northumberland, whose kittens were taken from her and given to a miller living at a distance of fully two miles, quite beyond the usual walk of a home-loving puss. The mother, however, although she had never been to the place before, and could by no possibility have known where her kittens were taken, made two successive journeys to the mill, each time bringing back in triumph to the rectory one of her dear ones.

So strong is the maternal instinct in the Cat that she will, if deprived of her own offspring, bestow her affections on animals of a totally different species, on creatures even, which, under ordinary circumstances, she would look upon as her natural and lawful prey. The following is a remarkable instance of this overpowering mother-love:—

"My friend had a little helpless Leveret brought to him, which the servants fed with milk in a spoon, and about the same time his Cat had kittens, which were despatched and buried. The Hare was soon lost, and was supposed to be gone the way of most foundlings, to be killed by some Dog or Cat. However, in about a fortnight, as the master was sitting in his garden in the dusk of evening, he observed his Cat, with tail erect, trotting towards him, and calling, with little, short, inward notes of complacency, such as they use towards their kittens, and something gambolling after, which proved to be the Leveret that the Cat had supported with her milk, and continued to support with great affection."*

Thus was a graminivorous animal nurtured by a carnivorous and predaceous one! Why so cruel and sanguinary a beast as a Cat, of the ferocious genus *Felis*, the *Murium Leo* (Lion of the Mice), as Linnæus calls it, should be affected with any tenderness towards an animal which is its natural prey, is not so easy to determine. This incident is no bad solution of that strange circumstance which grave historians, as well as the poets, assert of exposed children being sometimes nurtured by wild beasts that probably had lost their young. For it is not one whit more marvellous that Romulus and Remus, in their infant state, should be nursed by a she-Wolf, than that a poor little suckling Leveret should be fostered and cherished by a Cat.

White, in his "Observations," has another similar anecdote. "A boy has taken three little young Squirrels in their nest, or eyry, as it is called in these parts. These small creatures he put under the care of a Cat who had lately lost her kittens, and finds that she nurses and suckles them with the same assiduity and affection as if they were her own offspring. This circumstance corroborates my suspicion that the mention of exposed and deserted children being nurtured by female beasts of prey who had lost their young, may not be so improbable an incident as many have supposed; and, therefore, may be a justification of those authors who have gravely mentioned what some have deemed to be a wild and improbable story. So many people went to see the little Squirrels suckled by a Cat, that the foster-mother became jealous of her charge, and in pain for their safety, and therefore hid them over the ceiling, where one died. This circumstance showed her affection for these foundlings, and that she supposed the Squirrels to be her own young."

* White's "Selborne."

Equally remarkable as an instance of the transference of maternal affection is the tale of the Cat whose kittens were replaced by two out of the five pups belonging to a Spaniel. The Cat brought up her foster children so well, that they were able to run about long before the three left under the charge of their own natural mother. Before long they were removed, and the Cat was inconsolable, until, one day, coming across the Spaniel and her pups, she concluded that the latter were her own lost darlings, and in her eagerness to get them engaged in two successive fights with the Spaniel, in each of which she was victorious, and after each of which she carried away a pup to her own premises, thus getting again, as she thought, her own two children, and the Spaniel being obliged to content herself with one.

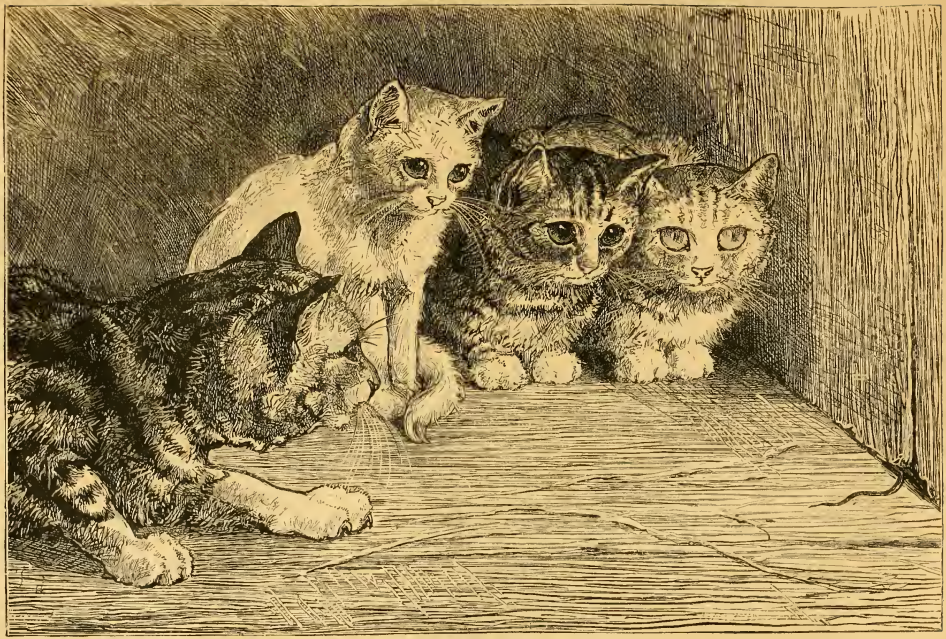
This last anecdote is also remarkable because of the wonderful instinctive antipathy existing between Dogs and Cats, an antipathy which is one of the most curious instances of inherited instinct, for a young kitten, who has never seen a Dog in its life will, on being approached by one, put up its back, and swear and spit with all the force of feline Billingsgate. It is only after living in the same house with a Dog for some time that a Cat will become reconciled to him, but when she once gets to tolerate his presence, the two often become very good friends.

The most astonishing tale we have met with, with respect to their intelligence and sensibility, is one by Mr. C. H. Ross. He states that a Cat in his possession "would climb upon the top of the piano, and, sitting close underneath the picture" of a Bulldog, "fix its eyes upon the Dog's face, and, putting back its ears, remain there, with a wild and terrified expression, for as long as an hour at a time," and this, too, while there were two living Dogs in the house with whom she was on perfectly good terms. This is extraordinary enough, for it is usually stated that animals do not recognise pictures unless they are coloured, and the illustration in question was an engraving. But the queerest part of the story is yet to come. "During the time that he noticed this conduct on the Cat's part, she was with kitten, and when the four kittens were born they were dead, and one of them, strange to say, had a Bull-dog-shaped head, marked almost exactly like the picture!"

Instances are not wanting in which Cats have formed friendships with birds—creatures which, as a rule, they look upon as their natural prey. One example of an affection of this sort is extremely curious. A Cat and a Canary had acquired a great fondness for one another. The Canary used to perch on the Cat's back and play all sorts of pranks with it. One day their master saw, with horror, the feline Damon rush upon his passerine Pythias and seize it in his mouth. He naturally thought that at last nature had triumphed over grace, but on looking round saw that another Cat had entered the room, to whose tender mercies the bird-lover would by no means trust his little friend.

Like its natural enemy the Dog, the Cat is sometimes afflicted with *rabies*, or madness. Mr. Youatt, a great authority on the subject, says:—"Fortunately for us this does not often occur; for a mad Cat is a truly ferocious animal. I have seen two cases, one of them to my cost; yet I am unable to give any satisfactory account of the progress of the disease. The first stage seems to be one of sullenness, and which would probably last to death; but from that sullenness it is dangerous to rouse the animal. It probably would not, except in the paroxysm of rage, attack any one; but during that paroxysm it has no fear, nor has its ferocity any bounds.

"A Cat that had been the inhabitant of a nursery, and the playmate of the children, had all at once become sullen and ill-tempered. It had taken refuge in an upper room, and could not be coaxed from the corner in which it had crouched. It was nearly dark when I went. I saw the horrible glare of her eyes, but I could not see so much of her as I wished, and I said that I would call again in the morning. I found the patient on the following day precisely in the same situation and the same attitude, crouched up in a corner, and ready to spring. I was very much interested in the case; and as I wanted to study the countenance of this demon, for she looked like one, I was foolishly, inexcusably imprudent. I went on my hands and knees, and brought my face nearly on a level with hers, and gazed on those glaring eyes and that horrible countenance, until I seemed to feel the deathly influence of a spell stealing over me. I was not afraid, but every mental and bodily power was, in a manner, suspended. My countenance, perhaps, alarmed her, for she sprang on me, fastened herself on my face, and bit through both my lips. She then darted down-stairs, and, I believe, was never seen again. I always have nitrate of silver in my pocket; even now I am never without it. I washed myself and applied the caustic with some severity to the wound; and my medical adviser and valued friend, Mr. Millington, punished me still more after I got home. My object was



DOMESTIC CATS—A STUDY.

attained, although at somewhat too much cost, for the expression of that brute's countenance will never be forgotten."

Except as fur-bearing animals, Cats are made no direct use of, save as Mouse and Rat-catchers. In this capacity they are quite invaluable, for these destructive little Rodents increase and multiply to such an extent, that if it was not for some such check as that afforded by the presence of a good mouser, many places would be as much overrun, and the inhabitants put to as much inconvenience, as were the people amongst whom Dick Whittington's lot was cast. With regard to the number of these plagues of which a single Cat can rid the neighbourhood, it is stated by M. Lenz, as a well-ascertained fact, that a Cat of ordinary size is fully capable of catching and eating twenty Mice a day, or 7,300 a year! Besides Rats and Mice, they are fond of insects, such as Cockroaches; and in some countries, such as Paraguay, they are found to be of great value in killing Serpents, which, however, they are said never to eat, slaying them by repeated dexterous blows of the paw, simply for the sport.

The Domestic Cat is found wherever civilised man exists. It occurs throughout Europe and Asia, and has spread largely in America and Australia since the discovery of these continents by Europeans. The best-marked variety of the species is the beautiful Angora Cat, which is larger than the ordinary Cat, and covered with long fine hair, usually snow-white. The Manx Cat, native only in the Isle of Man, is distinguished by the very remarkable character of being tailless, or, at least, that appendage is quite rudimentary. In other respects, it does not differ from the ordinary varieties. The Persian Cat is a very fine variety often seen in English drawing-rooms; its hair is long, though nothing like so long as that of the Angora. It is a remarkably lazy beast, and far less interesting than the ordinary kind.

The Chinese Cat has also long silky fur and pendent ears, and is regularly fattened and eaten. Mr. Swinhoe gives a curious quotation about this animal from the *Hainan Gazetteer*. "'*Lino*' (or *Domestic Cat*) 'cannot endure Fleas or Lice on its skin. Cats that have nine holes inside the mouth will catch Rats the four seasons through.'" What the Chinese *Gazetteer* means by the *nine holes* is difficult to imagine. Is it not a celestial piece of hyperbole for a Cat with a good large gullet?—just as we speak of their tenacity of life by saying that they have *nine lives*—thus our Cat has nine lives, and the Chinese Rat-catcher has *nine throats*.

CHAPTER V.

CAT FAMILY—HYÆNA FAMILY—CRYPTOPROCTA FAMILY—AARD-WOLF FAMILY.

The Common Jungle Cat—The Common Lynx—Historical Sketch—Geographical Distribution—Distinctive Characters—Habits—Uses—The Pardine Lynx—The Canadian Lynx—The Red Lynx—The Caracal—The Cheetah—Distinctive Characters—Geographical Distribution—Employment in Hunting—The Hyæna Family—External Characters—Skull and Teeth—The Spotted Hyæna—Geographical Distribution—Habits—Laughing Propensities—The Brown Hyæna—The Striped Hyæna—The Cryptoprocta Family—Characteristics of the Cryptoprocta—Its Occurrence and Habits—The Aard-Wolf Family—Characters and Habits of the Aard-Wolf.

THE COMMON JUNGLE CAT.*

This, as Mr. Jerdon observes, "is the Common Wild Cat all over India, from the Himalayas to Cape Comorin, and from the level of the sea to 7,000 or 8,000 feet of elevation. It frequents alike jungles and the open country, and is very partial to long grass and reeds, sugar-cane fields, corn-fields, &c. It does much damage to game of all kinds, Hares, Partridges, &c., and quite recently I shot a Peafowl at the edge of a sugar-cane field, when one of these Cats sprang out, seized the Peafowl, and, after a short struggle (for the bird was not dead), carried it off before my astonished eyes, and, in spite of my running up, made good his escape with his booty. It must have been stalking these very

* *Felis chaus.*

birds, so immediately did its spring follow my shot." Besides being so common in India, the Chaus is found all over Africa, especially in the north.

It is of a yellowish-grey colour, inclining to reddish in some parts, and white below. The muzzle and the limbs have dark stripes, and the tail is more or less ringed with black, but the greater part of the body is unspotted. It is interesting to notice that the annulation of the tail is most distinct in the young. We have elsewhere remarked that the young of all the one-coloured Cats (Lion, Puma, &c.), are more or less indistinctly spotted or striped. The ears are slightly tufted, so that this species, like the Spotted Wild Cat, approaches the Lynxes. The length of the head and body together is twenty-six inches; of the tail, nine or ten; the height at the shoulder fourteen or fifteen. A black variety is to be met with in some parts of India.

THE COMMON LYNX.*

In the Lynx we come again to an animal of historical interest, for this creature was well known to the ancients. It is mentioned by Pliny as having first appeared in the Amphitheatre at Rome in the time of Pompey, having been brought to the great city from Gaul, where, at that time, it was probably very abundant. No doubt it would cause grand sport in the arena, for it is an extremely savage beast, and capable of holding its own against animals many times its own size. The Lynx was also one of the animals sacred to Bacchus, and is sometimes represented, instead of the Leopard, as drawing the car of this deity.

But the Lynx of the ancients has, as Buffon remarks, quite the character of a fabulous animal. It was supposed "that its sight was so piercing as to penetrate opaque bodies, that its water had the marvellous property of becoming a solid body, a precious stone, called *lapis lyncurius!*" This last legend, as Brehm suggests, probably arose from the fact that the amber brought from Liguria was called *lapis ligurius*, and that the Greek merchants, knowing nothing about such a place as Liguria, corrupted *ligurius* into *lyncurius*, and, of course, connected it with *Lyncus*. A survival of the superstition about the Lynx being able to see through walls still exists in our common expression, "Lynx-eyed."

The Common Lynx is found chiefly in Norway, Sweden, Russia, and Northern Asia, and in the mountainous districts of Central Europe. In other parts of the Continent it is nearly or quite extinct.

The animal attains a much greater size than any of the ordinary Wild Cats, being as much as forty or fifty inches long, from the tip of its snout to the root of its tail. It is also readily distinguished from the Cats proper by the shortness of its tail, which does not exceed six to nine inches, or about one-fifth the length of the body, and by the length of its legs, which gives it a decidedly un-Cat-like look, and brings its height at the shoulder up to twenty-five inches. Another distinguishing feature is to be found in the long pointed ears, each with a tuft of long stiff hair on its tip; and still another is the length of the fur on the cheeks, whereby a pair of capital whiskers of almost Dundreary length is produced. These, it must be understood, are quite distinct from the true "whiskers," or tactile vibrissæ, with which the upper lip of the Lynx, like that of all *Felidæ*, is provided. The tufted ears and bearded cheeks, together with the fierce brightness of the eye, give the Lynx an altogether peculiar and somewhat weird expression

When we have added that the pads of the feet are overgrown with hair, we have mentioned all the obvious differences between a Lynx and a true Cat. In everything else, its teeth, its bones, its sheathed claws, its manner of killing its prey, its habit of swearing and spitting when angry, it is a Cat all over. Still, the differences between it and the ordinary Cats are considerable, and some naturalists prefer to look upon the Lynxes as a distinct genus (*Lyncus*); but, on the whole, especially when we consider how the chasm is bridged over by the Jungle Cat, it is more convenient to keep the two together, and consider the Lynxes as simply a section of the great genus *Felis*.

The skin of the Common Lynx is of a reddish-grey colour, more or less spotted with red or dark grey; but the variations in marking are very great in different individuals, and in the same individual at different ages. The fur, also, is longer in winter than in summer.

The Lynx is undoubtedly the most dangerous and destructive beast of prey now left in Europe;

* *Felis lynx.*

at any rate, a single Lynx will do more damage than an individual of any other wild species. The Russian Wolves may be, on the whole, worse enemies, but they hunt in packs, and are only dangerous

COMMON LYNX.

in numbers, a single Wolf being a sorry coward, while a Lynx is a truly redoubtable antagonist, as the following excellent account of his habits will show :—

"While he succeeds in finding food in the forests and gorges of the high mountains, he does not attempt to shift his quarters, but lives alone with his mate, and betrays his presence by horrible

howlings, audible at a great distance. He only quits his chosen solitude at the last extremity, and mounts on a branch, where he crouches at full length among the foliage, which half hides without incommoding him. With eye and ear on the watch, he remains whole days motionless, with eyes half closed, and in a state of apparent sleep, which is only the more dangerous, for then he is most completely cognisant of all that is passing around him. The Lynx lives by stratagem. Like all Cats, he has not a particularly fine sense of smell, and his pace is not sufficiently rapid to allow him to pursue his prey. His patience, and the skill with which he creeps noiselessly, bring him close up to his victim. More patient than the Fox, he is less cunning; less hardy than the Wolf, he leaps better and can resist famine longer. He is not so strong as the Bear, but keeps a better look-out, and

CANADIAN LYNX.

has sharper sight. His strength resides chiefly in his feet, jaws, and neck. He prefers to make his hunting as easy as possible, and only chooses his victim when food abounds. Every animal he can reach with one of his bounds, which rarely miss their aim, is lost and devoured; if he misses, he allows the animal to escape, and returns to crouch in his post of observation, without showing his disappointment. He is not voracious, but he loves warm blood, and this passion makes him imprudent . . . . . If he comes upon a flock of Goats or Sheep, he approaches, dragging his belly along the ground, like a Snake, then raises himself with a bound, falls on the back of his victim, breaks its neck or cuts its carotid with his teeth, and kills it instantaneously. Then he licks the blood which flows from the wound, rips open the belly, devours the entrails, gnaws off a part of the head, neck, and shoulder, and leaves the rest."* So bloodthirsty is his nature, that a single individual has been known to destroy forty Sheep in a few weeks. Fortunately for the inhabitants, this plague is now nearly extinct in Central Europe. It is extremely rare in the Alps, though it was

* Tschudi, quoted by Brehm.

CARACAL.

tolerably common within the last fifty years; and in the forests of Thuringia, only two have been found during the present century.

The Lynx, when caught young, is said to be quite tameable, but the domesticated animal is liable to die of over-fatness. Its flesh is eaten in Siberia, and even in Switzerland, but as usual with its tribe, the skin is the part on which the greatest value is set. It has a very beautiful hide, and in Siberia, where the greatest value is obtained, each one costs from twenty to fifty francs on the spot. "The skin of the fore-feet is sold separately; they are cut off, and fetch from ten to fifteen francs a pair. A Lynx skin is worth three of the Sable, six of the Wolf, twelve of the Fox, and a hundred of the Squirrel."

There are some differences as to size, &c., between the Lynxes found in Scandinavia and those inhabiting Central Europe. These are sometimes separated as distinct species, the former being then called *Felis boreadis*, the other *F. cervaria*: the latter is the larger of the two.

THE PARDINE LYNX.*

This animal takes the place of the common kind in Southern Europe, being especially abundant in Spain, where its range just overlaps that of its relative.

It is somewhat smaller than the Common Lynx—not more than thirty-two inches long. Its skin is of a beautiful rufous tint, regularly spotted with black, the spots extending over the tail, and the red colour merging into white on the under surface.

THE CANADIAN LYNX.†

This species (see figure, p. 73) replaces the European variety in North America, where it is especially abundant in the Rocky Mountains and in Canada.

It is about the same size as the Common Lynx. Its fur is shorter but thicker. The hairs on the back are darker, the points being ringed with grey and brown; those of the flanks are grey at the root, reddish-white at the extremity. It has the reputation of being a very lazy beast, and far less ferocious and more cowardly than its cousins of the Old World.

THE RED LYNX.‡

The Red Lynx is found in the United States, from the Pacific to the Atlantic. It differs but little in structure or habit from the species we have already described.

Its skin, as well as that of the Canadian kind, is a very important article of commerce.

THE CARACAL.§

This is the handsomest of the Lynxes (see figure on previous page), both on account of its elegant shape, and of its fine colour, which is a uniform reddish-brown or light chestnut, unspotted or very sparsely spotted in the adult, but showing distinct spots in the young. It is found in India, Persia, Arabia, and Tibet, and also throughout Africa. Its length varies from twenty-six to thirty inches, the tail measures nine or ten, and the height sixteen or eighteen inches. The ears are fully three inches long, black externally, white within, with a long dark ear-tuft.

Unlike the other Lynxes, the Caracal is made use of as a hunting animal, being occasionally trained to stalk the Peafowl, Hares, Kites, Crows, Cranes, &c. It is, however, a most savage animal in captivity. The specimen in the London Zoological Gardens seems to be in a permanent state of ill-temper. If the American Lynx, which is unfortunate enough to live in the same cage with him, dares to come "betwixt the wind and his nobility," or even if he, in the course of his peregrinations, should by chance get sufficiently near his companion to be annoyed with the sight of so vulgar a beast, he immediately arches his back, lays back his ears, uncovers his great canines, and swears in the most fearful manner, until the other unlucky animal is quite cowed, and looks as meek as its feline nature will allow it, evidently deprecating the anger of my lord, and although not conscious of having done wrong, quite ready to promise faithfully never to do it again.

* *Felis pardina.* † *Felis canadensis.* ‡ *Felis rufa.* § *Felis caracal.*

THE CHEETAH.*

The Hunting Leopard, or Cheetah, is the last member of the Cat family, and is distinguished from the foregoing forms of the group by its long legs, the peculiar form of the flesh tooth of the upper jaw, and by the fact that its claws are less perfectly retractile than those of other cats, owing to the excessive length of the elastic ligaments. So much struck have some observers been with the variation of the Cheetah from the ordinary feline type, that it has been named *Cynælurus*, or Dog-Cat, a very inappropriate name, as the animal is a Cat all over, as any one will see who will take the trouble to look at the specimens in the Zoological Gardens. No Dog has that round face, long tail, and supercilious, almost arrogant, expression.

The Cheetah is about four feet and half long from tip of snout to root of tail. The latter appendage is two feet and a half in length, and the height of the animal at the shoulder two feet and a half to two and three-quarters. The hide is of a bright reddish fawn-colour, and covered with numerous black spots, which are single, and not arrayed in rosettes, as in the Leopard, Jaguar, Ocelot, &c. The appearance of the face is very characteristic, owing to a black stripe which passes down the cheek in a sort of sigmoid curve, from the corner of the eye to the angle of the mouth. The tail has black spots and a black tip. The body is slender and small in the loins like a Greyhound's.

SKULL OF CHEETAH.

There are three varieties of this animal. One, the maneless Cheetah, is confined to Africa; another, the maned Cheetah, is found all over South-west Asia, and is distinguished from the first-named variety by its longer hair, and by the presence of a distinct though short mane, which, however, is more like the cheek-tufts (we must not call them whiskers, though they exactly resemble them, as that name is appropriated to the long vibrissæ) of the Tiger or Lynx than the mane of the Lion. The third variety is the woolly Cheetah, which differs so much from the other two, as to be usually separated as a distinct species (*Felis lanea*). Its hair is woolly, and the spots and face-mark light brown instead of black. The hind legs are unusually short. It is a native of South Africa.

Mr. Jerdon says, that "this animal was the original *Panther* and *Leopardus* of the ancients, who considered (with the Arabs of the present day in North Africa) that it was a breed between the Lion and the Pard." Possibly it was this animal to which Jeremiah alluded, when he said, "Can the Ethiopian change his skin, or the *Leopard* his spots?" For, although rare, it is still found in Palestine. Canon Tristram says, "A few still haunt the neighbourhood of Tabor and the hills of Galilee. In Gilead it is more common, and a sheikh there presented me with three skins of the Cheetah, shot by his people."

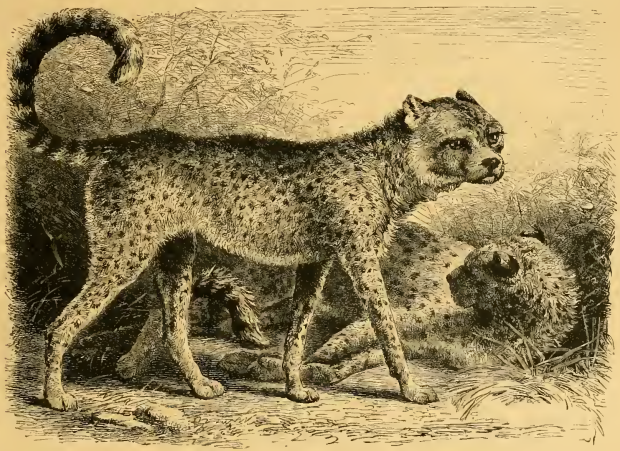
It frequents open plains, and hunts by day, in correspondence with which habits it has a circular and not an elliptical pupil to the eye.

The Cheetah is a half-domesticated animal; we say half-domesticated, because, although it is used regularly in hunting, yet it is never properly tamed, and always has to be, as it were, *gulled* into doing its work. The following account of the manner in which it is used in Indian sport is given by Mr. Jerdon†:—

"'On a hunting party,' says Buchanan Hamilton, 'the Cheetah is carried on a cart, hooded, and when the game is raised the hood is taken off. The Cheetah then leaps down, sometimes on the opposite side to its prey, and pursues the Antelope. If the latter is near the cart, the Cheetah springs forward with a surpassing velocity, perhaps exceeding that which any other quadruped possesses. This great velocity is not unlike the sudden spring by which the Tiger seizes its prey, but it is often continued for three or four hundred yards. If within this distance the Cheetah does not seize its prey, he stops, but apparently more from anger or disappointment than from fatigue, for his attitude is fierce, and he has been known immediately afterwards to pursue with equal rapidity another Antelope that happened to be passing. If the game is at too great a distance when the Cheetah's eyes

* *Felis jubata.* † "Mammals of India."

are uncovered, he generally gallops after it, until it approaches so near that he can seize it by a rapid spring. This gallop is as quick as the course of well-mounted horsemen. Sometimes, but rarely, the Cheetah endeavours to approach the game by stealth, and goes round a hill or rock until he can come upon it by surprise. This account of the manner of hunting I collected from the conversation of Sir Arthur Wellesley, who, while commanding officer at Seringapatam, kept five Cheetahs that formerly belonged to Tippoo Sultan.' Mr. Vigne writes thus :—'The hunting with Cheetahs has often been described, but it requires strong epithets to give an idea of the creature's speed. When slipped from the cart, he first walks towards the Antelope with his tail straightened, and slightly raised, the hackle on his shoulder erect, his head depressed, and his eyes intently fixed upon the poor animal, who does not yet perceive him. As the Antelope moves, he does the same, first trotting, then cantering after



CHEETAH.

him ; and when the prey starts off, the Cheetah makes a rush, to which (at least I thought so) the speed of a racehorse was, for the moment, much inferior. The Cheetahs that bound or spring upon their prey are not much esteemed, as they are too cunning. The good ones fairly run it down. When we consider that no English Greyhound ever yet, I believe, fairly ran into a doe Antelope, which is faster than the buck, some idea may be formed of the strides and velocity of an animal who usually closes with her immediately, but fortunately cannot draw a second breath, and, consequently, unless he strike the Antelope down at once, is obliged instantly to stop and give up the chase. He then walks about for three or four minutes in a towering passion, after which he again submits to be helped on the cart. He always singles out the biggest buck from the herd, and holds him by the throat until he is disabled, keeping one paw over the horns to prevent injury to himself. The doe he seizes in the same manner, but is careless of the position in which he may hold her.' The natives assert that (in the wild state) if the ground is not very favourable for his approaching them without being seen, he makes a circuit to the place where he thinks they will pass over, and if there is not grass enough to cover him, he scrapes up the earth all round, and lies flat until they approach so near that by a few bounds he can seize on his prey. Mr. W. Elliott says, 'They are taught always to single

out the buck, which is generally the last in the herd. The meer-shikars are unwilling to slip till they get the herd to run across them, when they drive on the cart and unhood the Cheetah.'

"I have only to add to this, on my own testimony, that I have often seen it, when unhooded, at some distance from the Antelope, crouch along the ground and choose any inequality of surface to enable it to get within proper distance of the Antelope. As to Vigne's idea of its rush being made during one breath, I consider it a native one, and unfounded, and I may say the same of its holding one paw over the horns of the buck. The Cheetah, after felling the Antelope, seizes it by the throat, and when the keeper comes up he cuts its throat and collects some of the blood in the wooden ladle from which it is always fed. This is offered to the Cheetah, who drops his hold, and laps it up eagerly, during which the hood is cleverly slipped on again. My tame Cheetah, when hungry or left alone (for it appeared unhappy when away from the Dogs with no one near it), had a plaintive cry, which Blyth appropriately calls a 'bleat-like mew.' Shikaries always assert that if taken as cubs they are useless for training, till they have been taught by their parents how to pull down their prey. This opinion is corroborated, in part at least, by my experiences with the tame one mentioned above."

Although capable of domestication, the Cheetah is, when roused, anything but a pleasant animal to come across. Two colonists from the Cape of Good Hope happened to meet one while they were out shooting Gazelles, and, unfortunately for themselves, pursued it. "The roughness of the road retarded the animal's flight, and a ball reached it. It immediately turned upon the hunter who had wounded it, and, leaping upon him, pulled him from his Horse, and a hand-to-hand conflict began between the two adversaries. The other hunter dismounted and hastened to succour his comrade, at the risk of hitting him as well as the animal from which he wished to deliver him. His shot was badly aimed. The noise of the discharge changed the aspect of the combat, for the Cheetah abandoned the man whom he had thrown down, to fling himself with redoubled fury on the new assailant, who had not even time to draw his hunting-knife. The animal seized him by the head, and, without letting go, rolled with him to the bottom of a ravine. It was of no avail that the first man, left alive, but horribly mutilated, dragged himself to the new battle-field; the wounds of his companion were mortal, and he only had the melancholy satisfaction of giving the *coup de grâce* to the animal, who was already exhausted by loss of blood."

It is curious, considering the constant domestication of this animal in India, that it does not breed at all readily in confinement. In fact, Mr. Bartlett, who probably knows more about the matter than any one, says that it has never to his knowledge bred in England; but Dr. Günther affirms that it has bred in the Gardens in Frankfort.

The young animal is covered with soft brown hair, without spots, a curious fact, quite reversing the usual order of things, for, as we have seen, the young of the Lion, Puma, and other one-coloured Cats, are distinctly spotted. The black mark on the cheek appears first, and then the body spots. Mr. Jerdon gives an interesting account of a Cheetah kitten belonging to him:—

"I brought up the young one above alluded to along with some Greyhound pups, and they soon became excellent friends. Even when nearly full-grown it would play with the Dogs (who did not over relish its bounding at them), and was always sportive and frolicsome. It got much attached to me, at once recognising its name (Billy), and it would follow me on horseback like a Dog, every now and then sitting down for a few seconds, and then racing on after me. It was very fond of being noticed, and used to purr just like a Cat. It used to climb on any high object—the stump of a tree, a stack of hay—and from this elevated perch look all round for some moving object. As it grew up, it took first to attacking some Sheep which I had in the compound, but I cured it of this by a few sound horsewhippings; then it would attack Donkeys, and get well kicked by them; and when not half-grown it flew one day at a full-grown tame Nylghau, and mauled its legs very severely before it could be called off. I had some Chikaras (*Gazella Bennettii*) caught, and let loose before it to train it. The young Cheetah almost always caught them easily, but it wanted address to pull them down, and did not hold them. Occasionally, if the Antelope got too far away, it would give up the chase, but if I then slipped a Greyhound, it would at once follow the Dog and join the chase. It was gradually getting to understand its work better, and had pulled down a well-grown Antelope Fawn, when I parted with it, as I was going on field service."

Brehm had a Cheetah called "Jack," which was so tame that his master led him about like a

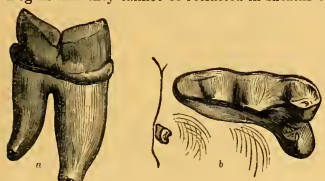
Dog, and even took him into a drawing-room full of ladies, by whom, after they had recovered their fright at seeing a real wild beast enter the room, he allowed himself to be patted and caressed. The same author states that a Cheetah once lived at large in an English seaport, and was the greatest possible favourite with the sailors and other inhabitants.

SKULL OF HYÆNA.

THE HYÆNA FAMILY *

This group contains the single genus *Hyæna*, one species of which, the Striped Hyæna (*H. striata*), inhabits North-east Asia and Northern Africa; the others (*H. crocuta* and *H. brunnea*) inhabiting South Africa.

Externally, the Hyænas have something the appearance of extremely ugly and unattractive-looking Dogs. They are somewhat larger than a Shepherd's Dog, and are covered with coarse bristly hair, short over the greater part of the body, but produced into a sort of mane along the ridge of the neck. The mode of progression is entirely digitigrade, the legs having much the same proportion as in an average Dog, except for the fact that the hind legs are shorter than the fore legs, so that the body slopes from the withers to the haunches. The claws resemble those of the Dog in that they cannot be retracted in sheaths of skin: here, therefore, we have a great and marked difference from all the Cat tribe.



TEETH OF HYÆNA.
a, First lower molar. *b*, Last upper premolar.

The tail is bushy, the snout long, but blunt, giving the beast a snub-nosed appearance and a horridly vulgar expression, quite different to that of most of his relatives. The long-nosedness is partly, however, only a matter of external appearance, for the skull, although nothing like as short as a Cat's, is yet very far from being as long as that of a Dog or a Civet, and it is still more Cat-like in the immense width of the cheek-arches, and the great development of bony ridges for the attachment of muscles. The great longitudinal ridge on the top of the skull is indeed far larger than in even the Lion or Tiger, and forms a great shelving crest, like that of an old-fashioned helmet. As we have already mentioned, this ridge is for the attachment of the great cheek muscles which close the jaw—muscles which, in the Hyæna, are of such power, that the animal's favourite way of attacking Dogs is to bite their legs off, and one of its choicest titbits is the marrow of bones, which can only be obtained by cracking the bone across, as we should crack a nut. Any one who has examined a Horse's or an Antelope's thigh-bone will have some notion of the power of jaws capable of smashing such a tough morsel.

LOWER JAW OF HYÆNA.

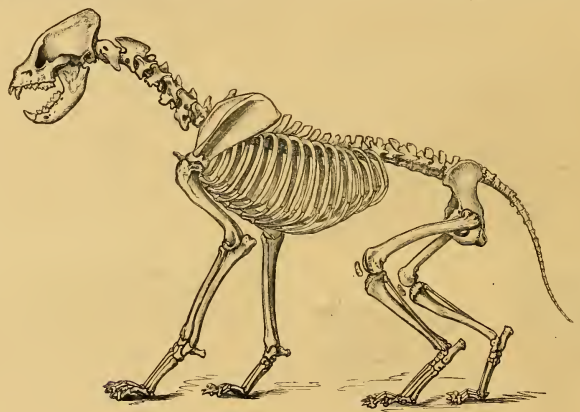
But something more is required than strong muscles for work such as this; and the Hyæna is

* *Hyænidæ.*

furnished with a set of tools which, when worked by such mighty power, are simply irresistible. The large grinding-teeth, instead of the scissor-blade form they have in the Cats, have great conical crowns, the base of the cone being belted by a strong ridge which defends the subjacent gum (see figure on preceding page). One has only to look at these teeth to see their perfect adaptation to their purpose. Sir Richard Owen remarks, "An eminent civil engineer, to whom I showed the jaw of a Hyæna, observed that the strong conical tooth, with its basal ridge, was a perfect model of a hammer for breaking stones for roads."

The canines of the Hyæna are proportionally much smaller than in the *Felidæ*, and the outermost incisor—that nearest the canine—is much larger than in the Cats, so that it approaches towards the canine in size. This, as we shall see, is even more the case in the Dog.

Then, the number of the teeth is different; the Hyæna is a less specialised animal than the Cats, that is, departs less from the average structure of a Mammal, and, in correspondence with this, we find



SKELETON OF HYÆNA.

that its jaws are longer and its teeth more numerous; it has, in fact, one more premolar, or false grinder, on each side of each jaw, bringing the total number of teeth to thirty-four, instead of thirty. (See p. 13.)*

In speaking of the Cat family, we mentioned that the characters of the floor of the skull, and particularly of the swollen, bulb-like *bulla tympani*, were of great importance in determining the position of an animal in the series. Now this *bulla* in the Hyæna is large and rounded, as in Cats, but differs in the fact that it is not divided by a bony partition into two compartments. The external opening of the cavity, too, is quite flush with its outer wall, and the clamp of bone (see figures on pp. 11 and 79) is quite close to its hinder wall.

In these characters, as well as in certain matters of internal structure, such as the presence of a small *cæcum*, or "blind-gut," the Hyænas approach to the Cats and Civets, being connected with the latter group by the curious Aard-Wolf. In other respects they approach the Dog family, their nearest ally in that group being the Cape Hunting Dog.†

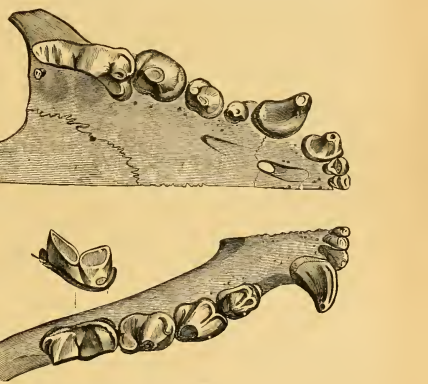
* The dental formula is—incisors, $\frac{3-3}{3-3}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{4-4}{3-3}$, molars, $\frac{1-1}{1-1}$, = 34.

† *Lycaon.*

THE SPOTTED HYÆNA.*

This species exists over the whole of Africa south of the Sahara, a portion of the continent which differs in a remarkable manner in its animal productions from the northern part; so much so that in a division of the world into regions for the purposes of studying the geographical distribution of animals, the north of Africa is united with Europe, while its ultra-Saharal portion is formed into a distinct region. Over this *Ethiopian region*, then, the Spotted Hyæna ranges, extending from Abyssinia and the Soudan in the north, where it meets with its striped brother, to Cape Colony, where it exists along with the curious Aard-Wolf. It is known as the "Wolf," or "Tiger-Wolf," by the Cape colonists, who, it seems, have a fancy for giving animals wrong names. We have seen already that the Leopard is with them a "Tiger."

The skin is of a yellowish-brown ground tint, irregularly blotched with circular black spots. On the back of the neck and on the withers it has a quantity of long stiff hairs, forming a kind of reversed mane. The fur is coarse and bristly, its character adding greatly to the animal's singularly unattractive appearance. The height at the shoulder is about two feet six or eight inches, the extreme length five feet ten inches, of which length the tail takes up some sixteen inches.



TEETH OF SPOTTED HYÆNA.

Like some other beasts of a similarly mean nature, the Spotted Hyæna prefers not to do his own killing, but likes better to live as a sort of humble messmate on those better provided than himself with the courage requisite to good hunters. When he does cater for himself, instead of subsisting on the leavings of his betters, he always makes his attack in a cowardly way, and trusts rather to stratagem than to any of the higher qualities of a sportsman. Dr. Livingstone says:—"In the evening of our second day at Serotli, a Hyæna appearing suddenly among the grass, succeeded in raising a panic among our cattle. This false mode of attack is the plan which this cowardly animal always adopts. His courage resembles closely that of a Turkey-cock. He will bite if an animal is running away; but if the animal stand still, so does he."

Other authors tell a similar tale, showing, too, that under cover of darkness the Hyæna can be moderately plucky; can, at any rate, muster sufficient courage to attack the herds in an encampment. "More than once, during dark and drizzling nights, they made their way into the sheep-kraal, where they committed sad havoc. We had several chases after them, but they managed invariably to elude us."† Again, "The Sheep having been placed in a pit to prevent them from straying, were visited during the night by a party of Hyænas, which slaughtered some and drove the residue to the summit of a high hill, where they were found the following morning."‡

The Hyæna has his misfortunes, like other beasts; Sheep are not to be had every day, often food is scarce, and he has to go with an empty stomach for days together. He may suffer, too, in other ways, besides hunger. Thus Mr. Andersson relates:—"Almost the first animal I saw at this place was a gigantic 'Tiger-Wolf,' or Spotted Hyæna, which, to my surprise, instead of seeking safety in flight, remained stationary, grinning in the most ghastly manner. Having approached within twenty

* *Hyæna crocuta.* † Andersson. ‡ Harris.

paces, I perceived, to my horror, that his fore-paws and the skin and flesh of his front legs had been gnawed away, and that he could scarcely move from the spot. To shorten the sufferings of the poor beast, I seized my opportunity and knocked him on the head with a stone, and catching him by the tail, drove my hunting-knife deep into his side. But I had to repeat the operation more than once before I could put an end to his existence. I am at a loss to account for his mangled condition. It certainly could not have been from age, for his teeth were good. Could it be possible that, from want of food, he had become too weak for further exertions, and that, as a last resource, he had attacked his own body? Or, was he an example of that extraordinary species of cruelty said to be practised by the Lion upon the Hyæna, when the latter has the insolence to interfere with the monarch's prey?" . . . "It is asserted by more than one experienced hunter, that when the Hyæna proves troublesome, the Lion has been known to bite off all its feet, and, thus mutilated, leave the poor animal to its fate."

It may well be imagined the horrible nuisance such animals are to all South African travellers. They steal everything they can get at. They devoured two handsome flags of Mr. Andersson's which he had hoped to plant on the shores of Lake 'Ngami. But, perhaps, the greatest trouble is caused by their infernal cachinnations; no noise in the forest produces so much discomfort, for though not so loud as the Lion's roar, it is totally devoid of grandeur, and is only hideously grotesque and vile in the ears of all but Hyænas, who, we suppose, are charmed by it. The traveller we have just mentioned was, during an illness, laughed to scorn in the most amazing fashion by Hyænas and Jackals, and their derision was too much for his equanimity at a time when he sorely needed sympathy and help. Flesh and water had become very scarce, and in his trouble he says, "One evening I desperately resolved to go to the water myself in the hope of succeeding better [than the attendants]. Accordingly I ordered my servants to prepare a 'skäran,' and to carry me there, taking the chance of being run over or gored by Elephants or Rhinoceroses, for in my disabled state it was impossible, should any animal charge, to get out of its way. Seeing my helpless condition, the men remonstrated, but I was resolved to go, and fortune favoured me. I had patiently waited till nigh morning without seeing anything but Hyænas and Jackals. I believe these creatures knew I would not hurt them, for they approached within a very few paces, staring and laughing at me in the most impudent manner. I threw gravel pebbles at them, but this only served to increase their mockery. I could stand it no longer, but hurled my camp-chair at their heads, when they quickly betook themselves to flight."

Livingstone had the same trouble with the fearful din. "An astonishing number of Hyænas collected round, and kept up a loud laughter for two whole nights. Some of them do make a very good imitation of a laugh. I asked my men what the Hyænas were laughing at, as they usually give animals credit for a share of intelligence. They said that they were laughing because we could not take the whole, and that they would have plenty to eat as well as we." Any one who has never heard the Hyæna laugh, and is anxious for that pleasure, has only to visit the Zoological Gardens at feeding time. Some give utterance to such horrible cachinnations when stirred up by the keeper, that one would think they are enough to wake the dead and madden the living.

Most hunters think it quite *infra dig.* to hunt so contemptible and cowardly a beast as the Hyæna. Regular expeditions are, however, organised against it by the Cape colonists, who set fire to the brushwood, to drive out the animals, which are then attacked by Dogs. A method of killing, considered more suitable to the beast, is that of the trap. Mr. Andersson succeeded in killing several by means of a cleverly arranged spring-gun.

THE BROWN HYÆNA.*

The Brown Hyæna, or "Strand-Wolf" of the Cape colonists, is tolerably common in South Africa, though far less so than the spotted species. It is a smaller animal than the latter, its usual height at the shoulder being about two feet four inches, its length, including the tail, four feet ten inches, the tail itself being about a foot in length.

Its general colour is reddish-grey, brindled with brown and black stripes or spots. The

* *Hyæna brunnea* or *fusca*.

STRIPED HYÆNAS AND JACKALS.

extremities are yellowish, with deep black transverse bands. The tail is black, with red hairs towards the tip.

As to habits, there is really nothing to add to what has already been said with regard to the Spotted Hyæna, except that it is especially common at the sea-side, and feeds a good deal on dead bodies thrown upon the shore. It only dares to attack flocks when very hungry.

THE STRIPED HYÆNA.*

The Striped Hyæna takes the place of the spotted kind over the northern part of Africa. It also extends into Asia, where it ranges over Asia Minor and Persia, and through India to the foot of the

HYÆNAS IN AN ARABIAN CEMETERY.

Himalayas. Amongst other places, it is "common in every part of Palestine, and indifferent as to the character of the country. We obtained the young occasionally in spring, and procured on Mount Carmel the largest pair of adults I ever saw. The old rock-hewn tombs afford to the Hyæna convenient covert. It attacks the graves even in the vicinity of towns."†

In ground-colour it resembles the spotted kind, but instead of being marked with spots, its hide is covered with complete black transverse bands like the hoops of a barrel, which extend downwards on to the legs. It is as nearly as possible of the same size as the brown variety.

As to its habits and characteristics, there is little to add to what has already been said of its South African brother; it follows the Lion for scraps, roams about the Arab cemeteries to dig up and devour the dead, prowls round the towns and villages in Egypt and elsewhere to pick up offal, and is always the same ugly, ill-conditioned, repulsive, and yet useful beast. For the Arabs and Egyptians

* *Hyæna striata.* † Canon Tristram.

are never greatly inclined to sanitary reform, and without Hyænas, Jackals, and Vultures, would be in a sad case indeed.

As to the animal's cowardliness, every writer bears witness. Jules Gérard says:—"The Arabs say, 'as cowardly as a Hyæna,' and the Arabs are right." So much do the sons of the desert despise their scavenger, that when Gérard killed one with his sabre, they implored him never again to use the defiled weapon, saying that it would certainly betray him after having been sheathed in such a dastardly carcass. It is stated that the Dog is the only animal the Hyæna dares attack, and even this game they like some help in killing. "When they feel inclined to eat a Dog, they hang about some douar, in the neighbourhood of which there happens to be a good cover. The female stations herself behind some brushwood, and the male goes towards the Dogs, who attack him, and follow him as far as the position of his consort. The female comes out at the fitting moment to attack, throttle, and devour on the spot the Dog who ventures farthest in pursuit of her husband."

Although the Hyæna is generally considered unworthy of being hunted, yet the Arabs occasionally condescend to come to the rescue of their Dogs, by beating their destroyers to death. They have also a curious "yarn" about a new and singular way of killing a Hyæna—a similar process to the traditional method of bird-catching. "The Arab who finds a Hyæna in his hole, takes a handful of Cow's dung, and presents it to him, saying, 'Come, and I will render you beautiful with henna.' The Hyæna holds out his paw; the Arab seizes it, drags him out, then gags him, and causes him to be stoned by the women and children of the douar, as a cowardly and unclean beast." One would have imagined that a Hyæna of ordinary mental capacity would be far too old to be caught with this sort of chaff!

THE CRYPTOPROCTA FAMILY.*

This family contains a single animal only, so that the description of the family and of the species will be identical. It has no English name, and must, therefore, be known by its scientific appellation, which is, unfortunately, none of the most musical.

THE CRYPTOPROCTA.†

This little animal is extremely interesting, from the fact that it forms a perfect transition between the Cat family on the one hand, and the Civet family on the other. Like the Cats it has truly retractile claws; unlike them it is *plantigrade*, or, rather, *semi-plantigrade*, for it does not walk on the tips of its toes, like a Cat or Dog, neither does it keep the whole sole of the foot flat to the ground like a Bear, but the soles of both fore and hind feet are devoid of hairs, except for a short space near the ankle and heel, and it is the large hairless space which is applied to the ground in walking.

The characters of the skull are almost exactly half way between those of the two families we have mentioned. The bulb of the ear has its opening quite flush with its outer wall, but is far less swollen than in the Cats. The teeth differ from those of Cats in one important particular, namely, in the fact of there being one more premolar in each jaw.

The Cryptoprocta is about thirteen inches and a half long from snout to root of tail, the latter appendage being nearly as long as the body. The general colour is light brownish-red, this tint being produced by the individual hairs being ringed with yellow and brown alternately. The body is slender and elegantly formed. The head is also well shaped, with a pointed snout, and large rounded ears. There are five toes on each foot, and, as we have already mentioned, the claws are provided with true retractile ligaments.

This curious and interesting little animal is very rare; only one or two specimens having reached Europe. Even at the present time hardly anything is known of its internal organs. It was first brought to England forty or fifty years ago. "Mr. Telfair, President of the Mauritius Natural History Society, who presented the animal to the Zoological Society of London, received it from the interior and southern part of Madagascar, and stated that it was the most savage creature of its size he ever met with. Its motions and power and activity were those of a Tiger, and it had the same appetite for blood and destruction of animal life. Its muscular force was very great, and the muscles of its limbs were remarkably full and thick. It lived with Mr. Telfair for some months."

* *Cryptoproctidæ.* † *Cryptoprocta ferox.*

AARD-WOLF.

THE AARD-WOLF FAMILY.*

This family contains but a single genus and species, viz. :—

THE AARD-WOLF.†

This is a remarkable animal inhabiting the southern parts of Africa, where its range is almost co-extensive with that of the brown variety of the Hyæna. It is an extremely interesting animal, as it forms a connecting link between the Civet family and the Hyænas; although more nearly allied to the latter than to the former, it is found to be impossible to assign it to one of these groups in reference to the other, and it is, in consequence, placed in a family by itself.

* *Protelidæ.* † *Proteles Lalandii.*

This rare animal was first mentioned and described by Andrew Sparman in 1772-6, but his account of it attracted little notice until it was re-discovered by the traveller Delalande, who brought specimens to France, where the beast was described and christened after him, *Proteles Lalandii*, or *Delalandii*.

The relationships of the Aard-Wolf are well shown by its external appearance. It has the sloping back of a Hyæna, owing to the fore legs being longer than the hind legs; but its head is quite Civet-like, the snout being long and pointed, and altogether unlike a Hyæna's. Its size is that of a full-grown Fox, but it stands higher upon its legs; its ears are considerably larger and more naked, and its tail shorter and not so bushy. At first sight it might be easily mistaken for a young Striped Hyæna, so closely does it resemble that animal in the colours and peculiar markings of its fur, and in the mane of long stiff hair which runs along the neck and back; indeed, it is only to be distinguished by its more pointed head, and by the additional fifth toe of the fore-feet. It is also quite Hyæna-like in colour, being of a dull yellowish-grey tint, and marked with dark brown stripes and a black muzzle.

SKULL OF AARD-WOLF.

The skull has all the essential characters of that of a Viverrine, the form to which it approaches most nearly being the Ichneumon. The teeth are also Civet-like, but in the characters of its internal organs it approaches more nearly to the Hyænas.

"In its habits and manners the Aard-Wolf resembles the Fox. Like that animal it is nocturnal, and constructs a subterraneous burrow, at the bottom of which it lies concealed during the day-time, and only ventures abroad on the approach of night to search for food, and satisfy the other calls of nature. It is fond of the society of its own species; at least many individuals have been found residing together in the same burrow; and, as they are of a timid and wary character, they have generally three or four entrances to this hole; so that, if attacked on one side, they may secure a retreat in an opposite direction. Notwithstanding the disproportionate length of their fore legs, they are said to run very fast, and so strong is their propensity to burrow, that one of M. Delalande's specimens, perceiving itself about to be run down or captured, immediately ceased its flight, and began to scratch up the ground, as if with the intention of making a new earth." Its food consists very largely of carrion, but it also devours Ants. Owing to the former "high" kind of diet, the animal is generally possessed of an extremely bad smell.

With regard to its fighting propensities, which it probably possesses in common with all its relations—partly from the necessities of the struggle for existence, and partly from pure quarrelsomeness—we may mention Professor Flower's observation, that there is a "rounded patch in front of each wrist joint," or "knee," as the wrist of digitigrade quadrupeds is usually called, just as if the animals were in the constant habit of kneeling. Professor Flower adds in a note:—"Mr. Bartlett informs me that this is the habit both of the *Proteles* and the Hyænas, especially when fighting. He attributes it, at least in the case of the Hyænas, to an instinctive dread lest their feet should be seized and crushed by the powerful jaws of their adversary."

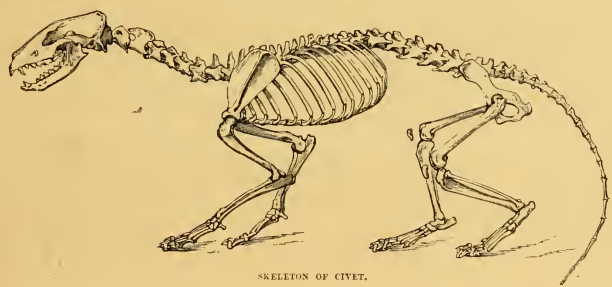
CHAPTER VI.

THE CIVET FAMILY.

General Characteristics of the Civet Family—Their Scent, Skull, and Teeth—The African Civet—Its Characters and Habits—The Asiatic Civet—The Lesser Civet—The Genette—The Mungoos, or Ichneumon—Curious Superstition regarding it—The Crab Mungoos—The Paradoxure—The Binturong.

The name of this family* is given to it from the fact that the most important forms included in it are what are known as Civets, or Civet Cats, animals from which the well-known perfume of that name is obtained.

The civet is a white, fatty substance, found in two curious little pouches or turnings-in of the skin just under the animal's tail. Thus Touchstone says: "Civet is of a baser birth than tar; the very



SKELETON OF CIVET.

uncleanly flux of a Cat." The perfume "is procured by scraping the inside of the pouch with an iron spatula at intervals, about twice a week. If the animal is in good condition and a male, especially if he has been irritated, a drachm or thereabouts is obtained each time. The quantity collected from the female does not equal that secreted by the male. Civet, like most other articles of this nature, is much adulterated, and it is rare to get it quite pure. The adulteration is effected with suet or oil, to make it heavier."

Civet is far less esteemed as a perfume now than in former times; its odour is rank and almost overpoweringly strong, so that musk and other vegetable perfumes are now generally preferred. But in Shakspere's time it was quite "the thing." Don Pedro, in "Much Ado," says of Benedick: "Nay, he rubs himself with civet: can you smell him out by that?" And Claudio answers: "That's as much as to say, the sweet youth's in love."

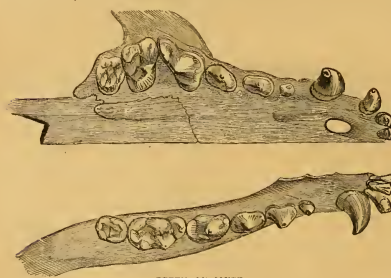
The animals comprised in this group are confined entirely to the Old World, where they are represented in South Europe by the domesticated Genette; in Africa and South Asia by the true Civet (*Viverra*), the Ichneumons, so celebrated for their propensity for eating Crocodile's eggs, the curious Paradoxures, and many others.

In anatomical characters, as well as in external appearance, the animals are related both to the Cat family and to the Hyænas, as will be seen by comparing the various points of their structure with

* *Viverridæ.*

those of the two families just named. They are mostly long-bodied, short-legged animals, with stiffish fur, a long tail, and a sharp muzzle. They walk on their toes, of which they have five on each foot, like Cats; many of them, however, keeping the wrist and ankle much nearer the ground than the Cats do, and being consequently distinguished as *semi-plantigrade*. They also wander from the regular Cat-structure in the matter of their claws, which are only *half* retractile, the elastic ligament not attaining the same perfection as in the Cats. Thus we conclude that in this respect, at any rate, the Civets are less *specialised* than the Cats proper; they approach more nearly to the central plan of Mammalian structure, and are less perfect as Carnivores. We shall see that the same is the case with respect to their other characters, such as the skull and teeth.

The skull is not unlike what a Cat's would be if it were put on the bed of Procrustes and pulled out; for, in correspondence with the length of the snout in these creatures, the face part of the skull is long in comparison with the brain-containing part. The cheek-arches, also, are by no means so broad as in the *Felidæ*, in correspondence with the less size of the jaw muscles. But the character of the base of the skull is pretty much the same. There is, as in Cats, the large swollen *bulla*, or ear-drum bone, the small opening flush with the outer wall of the bulla, and the clamping bone closely applied to its hinder wall.



TEETH OF CIVET.

The teeth of the Civets present many interesting differences from those of the Cat tribe. In the first place, in accordance with the less perfectly carnivorous habit of the group, the jaws are longer, and, consequently, not so powerful as in the Cat; the number of teeth also is considerably increased. The incisors and canines remain the same, but the premolars are increased to four, and the molars to two on each side of each jaw,* so that there are no less than forty teeth, instead of thirty only, as in the Cats. Then the form of the teeth is altered: the canines are of far less proportional size, not having the same amount of hard work to do as the great dog teeth of the Lion or Tiger; the grinders, too, lose their scissor-blade form, and exhibit on their upper surfaces little lumps, or *cusps*, thereby developing a grinding surface such as no Cat has. This is especially the case in the Paradoxures, or Palm-Cats, which have quite lost all carnivorous habits, and feed chiefly on the fruit of palm-trees.

THE AFRICAN CIVET.†

This animal, by its rough spotted skin, calls to mind the Hyæna, to which, however, it is inferior in size, being hardly three feet long. It differs also from our laughing friend in many more important particulars. Its legs are shorter, its tail longer and not so bushy, its snout more pointed, its ears shorter, and its expression less villainous-looking. It is found in the North of Africa and in Eastern Asia.

This animal is the chief of the civet producers, its scent-glands being large and secreting constantly. At the Zoological Gardens the specimen in captivity rubs the perfume against the walls of the cage, where it is scraped up by the keeper, for whom it is a not unimportant perquisite.

The hair is long, coarse, of a brownish-grey colour, and marked with interrupted transverse

* The dental formula is, therefore, incisors, $\frac{3-3}{3-3}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{4-4}{4-4}$, molars, $\frac{2-2}{2-2}=40$.

† *Viverra civetta.*

bands or spots. On the middle line of the back and between the shoulders its hair is longer, forming a sort of mane. The snout is white, the tail ringed with black.

"The Civet approaches, in its habits, nearest to the Foxes and smaller Cats, preferring to make its predatory excursions against birds and smaller quadrupeds in the night, although, like other Carnivora, it will occasionally attack its prey in the daytime. In a state of captivity it becomes in a degree tame, but never familiar, and is dangerous to handle. The young ones feed on farinaceous food—millet-pap, for instance—with a little flesh or fish, and when old on raw flesh. Many of them are kept in North Africa, to obtain the perfume which bears the name of the animal, and brings a high price."

The great naturalist, Cuvier, says of a Civet kept at Paris:—"Its musky odour was always

AFRICAN CIVET.

perceptible, but became stronger than usual when the animal was irritated. At such times little lumps of odoriferous matter fell from its pouch. These masses were also produced when the animal was left alone, but only at intervals of fifteen or twenty days. This Civet passed nearly all day and the whole night in sleeping, rolling itself up with its head between its legs; it was necessary to threaten or even strike it to rouse it from its lethargy."

THE ASIATIC CIVET.*

The Asiatic Civet, large Civet Cat, or Zibet, "inhabits Bengal, extending northwards into Nepaul and Sikkim, and into Cuttack, Orissa, and Central India on the south. It also extends into Assam, Burmah, Southern China, and parts of Malayana. It is said to frequent brushwood and grass, also the dense thorny scrub that usually covers the bends of tanks. It is very carnivorous, and destructive to poultry, game, &c., but will also, it is said, eat fish, crabs, and insects. Hounds, and indeed all Dogs, are greatly excited by the scent of the Civet, and will leave any other scent for it. It will readily take to water if hard pressed."

* *Viverra Zibetha.*

The Zibet is forty-seven to fifty-six inches in length, from thirteen to twenty of this being taken up by the tail. It is of a yellowish-grey colour, with black spots and stripes. The throat and sides of the neck are white, and the fine tail is ringed with black.

This species is said to be tamed more easily than its African relative; but of this, as well as of its habits, very little is known.

THE LESSER CIVET.*

The Lesser Civet, or Rasse, is found in the island of Java, as well as in many parts of India, such as Nepaul and Madras. "It is not an uncommon species in Hong-Kong and the adjacent islands. In Formosa it is the commonest of all the carnivorous group. Skulking during the day in the dark ravines that intersect the hilly country in the north-west, in the twilight it threads its way

LESSER CIVET.

with great speed through the long grass, and searches the fields for small mammals and birds. It is much dreaded by the Chinese for the havoc it commits in the hen-roost; and as its skin is somewhat valued for lining to great coats, its haunts and creeps are sought after, and traps laid for it. Of these the slip-knot noose for the head and feet is the most commonly practised and the most killing. As the cool season approaches, hawkers may be daily met with, even in the villages, offering for sale the stretched skins of these animals. The poorer classes, who are unable to purchase the dearer furs, make use of these cheaper yet pretty skins." The Rasse is about thirty-two inches in length, its tail thirteen inches. The odour of musk is so strong as to taint the skin and the flesh of the entire animal. "The Chinese," says Mr. Swinhoe, "eat the flesh of this animal; but a portion that I had cooked was so affected with the Civet odour that I could not palate it."

The Rasse is a much smaller animal than the two preceding species, its head and body together being about twenty-two or twenty-three inches long, and its tail sixteen or seventeen. It is of a yellowish or brownish-grey colour, with longitudinal bands on the back, and regular rows of spots on the side. The tail has eight or nine complete dark rings.

In India it is kept tame, the natives often domesticating it for the purpose of more conveniently extracting the civet.

* *Viverra pallida* seu *rasse*.

THE GENETTE.*

This is the only Viverrine animal common in Europe, in some parts of which it is a regularly domesticated animal, and catches Mice as well as a Cat. Besides living in all the southern parts of Europe, it is found in the whole of Africa north of the Sahara, that wonderful desert which constitutes a boundary as efficient in preventing the dispersal of animals as an ocean. In this, as in many other cases, the North African animals are identical, or agree closely with those of Europe, while those of trans-Saharal Africa are of an entirely different character.

The fur of the Genette is of a grey colour, "spotted with small black or brown patches, which are sometimes round and sometimes oblong. The tail, which is as long as the body (about twenty-one inches), is ringed with black and white, the black rings being to the number of nine or eleven. There are white spots on the eyebrows, the cheeks, and the end of the nose."

The civet-pouches are, in this genus, reduced to very slight depressions at the sides of the root of the tail, and although the odour of the animal is tolerably strong—yet not disagreeably so, as in the Civet—there is no perceptible secretion from these pouches.

THE MUNGOOS, OR ICHNEUMON.†

The Ichneumons, or Mungooses, form a well-defined genus of Weasel-like animals, with semi-plantigrade feet, five toes provided with somewhat retractile claws, and long tails. The species now under consideration is found in Southern India as well as "in the North-west Provinces and the Punjab, and throughout the Deccan up to the Nerbudda River. It frequents alike the open country and low jungles, being found in dense hedgerows, thickets, holes in banks, &c., and it is very destructive to such birds as frequent the ground," for it only sucks the blood, and so kills many birds before it is satisfied.

It is sixteen or seventeen inches long, its tail fourteen, and is of a tawny yellowish-grey colour. The head is marked with reddish and yellowish rings, so arranged as to produce a resultant iron-grey hue.

There is a curious superstition about the Mungoos, of which Sir Emerson Tennent says: "I have found universally that the natives of Ceylon attach no credit to the European story of the Mungoos (*H. griseus*) resorting to some plant, which no one has yet succeeded in identifying, as an antidote against the bite of the venomous Serpents on which it preys. There is no doubt that, in its conflicts with Cobra di Capello and poisonous Snakes, which it attacks with as little hesitation as the harmless ones, it may be seen occasionally to retreat, and even to retire into the jungle, and, it is added, to eat some vegetable; but a gentleman, who had been a frequent observer of its exploits, assures me that most usually the herb it resorted to was grass, and if this were not at hand, almost any other plant that grew near seemed equally acceptable. Hence has probably arisen the long list of plants, such as the *Ophioxylon serpentinum*‡ and *Ophiorhiza mungos*,§ the *Aristolochia indica*,‖ the *Mimosa octandria*,¶ and others, each of which has been asserted to be the Ichneumon's specific; whilst their multiplicity is demonstrative of the non-existence of any one in particular on which the animal relies as an antidote. Were there any truth in the tale as regards the Mungoos, it would be difficult to understand why creatures, such as the Secretary-bird and the Falcon, and others, which equally destroy Serpents, should be left defenceless, and the Ichneumon alone provided with a prophylactic. Besides, were the Ichneumon inspired by that courage which would result from the consciousness of security, it would be so indifferent to the bite of the Serpent that we might conclude that, both in its approaches and its assaults, it would be utterly careless as to the precise mode of its attack. Such, however, is far from being the case; and, next to its audacity, nothing could be more surprising than the adroitness with

* *Genetta vulgaris.* † *Herpestes griseus.*

‡ A plant allied to that which produces the well-known *nux vomica*. It is used by Indian physicians in fevers, and as an antidote to poisons.

§ A tree allied to that which produces Peruvian bark. It is called the Mungo, or "Earth-gall," by the Malays. It is also supposed to be an antidote to poisons.

‖ The "birth-wort." It is used in India as a remedy for gout, and in England is given to Cows after calving.

¶ A tree allied to the acacias and to the sensitive plant.

ICHNEUMONS.

which it escapes the spring of the Snake under a due sense of danger, and the cunning with which it makes its arrangements to leap upon the back and fasten its teeth in the neck of the Cobra. It is this display of instinctive ingenuity that Lucan celebrates when he paints the Ichneumon diverting

the attention of the Asp by the motion of his bushy tail,* and then seizing it in the midst of its confusion.

"The mystery of the Mungoos and its antidote has been referred to the supposition that there may be some peculiarity in its organisation which renders it proof against the poison of the Serpent. It remains for future investigation to determine how far this conjecture is founded on truth; and whether in the blood of the Mungoos there exists any element or quality which acts as a prophylactic. Such exceptional provisions are not without precedent in the animal economy. The Hornbill feeds with impunity on the deadly fruit of the Strychnos;† the milky juice of some species of Euphorbia, which is harmless to Oxen, is invariably fatal to the Zebra; and the Tsetse Fly, the pest of South Africa, whose bite is mortal to the Ox, the Dog, and the Horse, is harmless to man and the untamed creatures of the forest."

THE CRAB MUNGOOS.‡

This animal is usually considered to be sufficiently different from the other Mungooses as to require a separate generic name. It has an almost Snake-like body, and a very long, slender snout. It is of an iron-grey colour, with a very well-marked white stripe on each side of the neck. The tail is reddish and very thick, and attains a length of eleven inches, the head and body together being eighteen inches in length.

Like the Civets, it has glands situated near the root of the tail, but these glands, instead of secreting a perfume, produce a fluid of the most abominably fetid odour, so that the beast is by no means a pleasant one to come near. Moreover, to make matters worse, the secretion of these glands does not quietly ooze out as in the Civets, but the sacs are provided with muscles, by the aid of which the animal is able to squirt out the noxious stuff to a considerable distance upon any offending person.

"This curious animal has been found in the South-east Himalayas, extending into Assam and Arakan. In its habits it is somewhat aquatic, preferring, it is said by Hodgson, Frogs and Crabs. It lives in burrows in the valleys of the lower and central regions of Nepaul."

THE COMMON PARADOXURE.§

This animal, and other species of the same genus, are often called "Tree Cats," or "Palm Cats," but as they are not Cats at all, it is better to throw over the incorrect English name, and follow the plan which, as the reader may see, is adopted on the labels at the Zoological Gardens in this and similar cases: that is, Anglicise the Latin name, even at the risk of using a somewhat long and ugly word; but, as Milton says:—

> "Why, is it harder, sirs, than Gordon,
> Colkitto, or Macdonnel, or Galasp?
> Those rugged names to our like mouths grow sleek,
> That would have made Quintilian stare and gasp."

The name Paradoxurus—"queer-tailed"—was given to the genus from the fact that some of the animals composing it have their tails curled round into a sort of screw, the under side being thus brought uppermost. The name "Tree Cat" is very inappropriate, as the Paradoxures are not in the least like Cats, but resemble far more closely the Civets, which are, indeed, their nearest allies. They are long-bodied and short-legged, with sharp snouts and long tails, and are almost completely plantigrade.

The Common Paradoxure varies a good deal as to the character of its fur. The ground-colour is usually "brownish-black, with some dingy yellowish stripes on each side, more or less distinct, and sometimes not noticeable; a white spot above and below each eye, and the forehead with a whitish band in some; a black line from the top of the head down the centre of the nose is generally observable." The individual hairs are yellowish at the base and blackish at the tip, and according to the state of wear and tear of these, the animal appears to be of various shades of tawny, brown, blackish, &c. The head and body together attain a length of twenty-two to twenty-five inches, the tail nineteen to twenty-one.

* *Pharsalia*, lib. iv. 729. † The nux vomica plant. ‡ *Urva cancrivora*. § *Paradoxurus musang*.

"This Tree Cat is a common and abundant animal throughout the greater part of India and Ceylon, extending through Burmah and the Malayan Peninsula to the island. It is most abundant in the latter wooded region, and is rarely met with in the low portions of the Deccan, Central India, and the North-West Provinces. It is very abundant on the Carnatic and Malabar coast, where it is popularly called the *Toddy Cat*, in consequence of its supposed preference for the juice of the palm, a fact which appears of general acceptation both in India and Ceylon (where it is called the Palm Cat), and which appears to have some foundation. Kelaart says: 'It is a well-established fact that it is a consumer of palm toddy.' It lives much in trees, especially in the palmyra and cocoa-nut palms, and is often found to have taken up its residence in the thick thatched roofs of native houses. I found a large colony of them established among the rafters of my own house at Tillichery. It is occasionally found in dry

COMMON PARADOXURE.

drains, outhouses, and other places of shelter. It is quite nocturnal, issuing forth at dark, and living by preference on animal food, rats, lizards, small birds, poultry, and eggs; but it also freely partakes of vegetable food, fruit, and insects. In confinement it will eat plantain, boiled rice, bread and milk, &c. Colonel Sykes mentions that it is very fond of Cockroaches. Now and then it will commit depredations in some poultry-yard; and I have often known them taken in traps baited with a Pigeon or a Chicken. In the south of India it is very often tamed, and becomes quite domestic, and even affectionate in its manners. One I saw, many years ago, at Trichinopoly, went about quite at large, and late every night used to work itself under the pillow of its owner, roll itself up into a ball, with its tail curled round its body, and sleep till a late hour of the day. It hunted for Rats, Shrews, and House Lizards. Their activity in climbing is very great; and they used to ascend and descend my house, at one of the corners of the building, in a most surprising manner." Sir Emerson Tennent states that in Ceylon the Palm Cat makes fearful havoc with the fowls of the villagers, "and, in order to suck the blood of its victims, inflicts a wound so small as to be almost imperceptible."

THE BINTURONG.*

This is a curious little animal, of a black colour, with a white border to its ears, a large head and turned-up nose, and a long, immensely thick, tapering tail, which, remarkably enough, is prehensile,

* *Arctictis binturong.*

like that of a New World Monkey. It is twenty-eight to thirty inches long from snout to root of tail, and the tail itself is nearly of the same length. It is sometimes called the "black Bear Cat."

"It is slow and crouching. In its habits it is quite nocturnal, solitary, and arboreal, creeping along the large branches, and aiding itself by its prehensile tail. It is omnivorous, eating small animals, birds, insects, fruit, and plants. It is more wild and retiring than Viverrine animals in

BINTURONG.

general, and it is easily tamed; its howl is loud." It walks entirely on the soles of its feet, and its claws are not retractile. It ranges from Nepaul to Sumatra and Java.

Altogether the Binturong is a decidedly interesting animal, and has been a great puzzle to zoologists. It was formerly placed in the Racoon family, to many of the members of which it bears a very strong resemblance; but this resemblance is quite superficial, and brought about by the similarity in the mode of life, &c. In the characters of the skull and teeth, it undoubtedly belongs where we have placed it, among the Civet group. Thus it forms a capital warning to those zoologists whose knowledge is only skin-deep, and who group animals entirely by their external character, without taking into account the important points of fundamental structure, which should in every case be considered first.*

* N.B.—The description of some members of the Viverridæ, or Civet family, has been inadvertently omitted from our chapter on that group, and will be found at the end of the article on the Land Carnivora (pp. 206—208).

CHAPTER VII.

THE DOG FAMILY.—THE DOMESTIC DOG.*

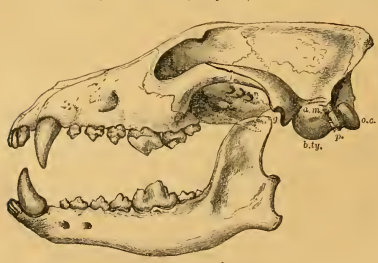
Section *Cynoidea*—Geographical Distribution—Skull of Dog—Teeth—Legs—Walk—Claws—Internal Anatomy—The Cæcum, or "Cul de sac" of the Intestine—Size—THE DOMESTIC DOG—Its Fidelity and Love—Differences between the Domesticated and Natural Species of the Family—Barking a Civilised Habit—Antiquity of the Dog—The Dog among the Hebrews and Egyptians—The Dog in the Bible—"Dog" as a Term of Reproach—Venerated by many Ancient Nations—The Dog among the Greeks and Romans—Pre-historic Dogs—Dogs in the New World—Peruvian Dogs—Superstitions about the Dog—The Dog as an article of Diet—Origin of the Dog—Identity of Structure of Wild and Domestic Dogs—The independent Training of Wild *Canidæ* by Savages in many parts of the World—Voice—Results of the whole question as to Origin—Anecdotes about Instinct, Reason, Docility—Muscles of Dog's Head—Consociation of Dogs—Anecdotes of Sense of Right, Wrong, Duty, Conscience, Sensitiveness, Honesty, Theft, Cunning, Quarrelsomeness, Magnanimity, the reverse, Revenge, Hatred—Conjugal Affection—Devotion to Man—Fickleness—Despair—Rabies and Hydrophobia—Wonderful Variety of Breed.

WE now come to the first and only family of the section *Cynoidea*, the most compact of the three divisions of split-footed flesh-eaters, and the one which contains the smallest number of forms. Only four genera, in fact, are contained in the group, namely, the Dogs, Wolves, and Foxes (*Canis*), the Long-eared Fox (*Megalotis*), the Racoon-dog (*Nyctereutes*), and the curious Hyæna-like *Lycaon*.

But the group is none the less interesting for the small number of forms included in it; for containing, as it does, the Dog, the animal of all others entitled to the name domestic, it yields in importance to neither of the larger groups, notwithstanding the varied series of creatures enclosed within their pale. Members of the Dog family are found in nearly all parts of the world, being absent only in the West Indian Islands, Madagascar, the eastern islands of the Malayan Archipelago, New Zealand, and the Polynesian Islands. When we say that the Dog is absent from those places, we mean, of course, *as a true native*. Wherever civilised man has penetrated, there his four-footed friend is sure to be found; but in the places just mentioned no Dog, Wolf, or Fox occurs as a true aboriginal. Very probably, the gigantic island of Australia should be added to the above list, as it is by no means certain that the Dingo, or wild Dog found there, has not been introduced by man.

The Dogs form a sort of connecting link between the Cat-like species on the one hand, and the Bear-like group on the other. In the matter of being digitigrade, they agree with the Cats; the number of their teeth agrees with that of the Bears; in the character of the skull they come just half-way between the two.

On the under surface of the Dog's skull there is found, in a corresponding position to the ear-drum swelling of the Cat (see p. 11), a similar rounded swelling, which, however, is smaller in proportion to the size of the skull, rougher in texture, and not so regular in shape, but sloping towards its outer aperture. Moreover, the margins of its outer aperture, round which the external ear is fixed, are produced outwards into a short tube or spout, thus making a small bony ear-passage beyond or external to the rim to which the drum membrane is attached. In the Cat, it will be remembered, there was no bony tube of this sort, but the drum parchment was flush with the margins of the opening of the drum cavity. Then the partition, which was so large in the Cat, dividing the cavity into two compartments, is here reduced to quite a low wall. Lastly, the bony clamp, which we mentioned in the Cat as being fixed quite closely against the hinder face of the bulla, is here separated from it by a small valley. These skull characters are very characteristic of the Cynoidea, and are therefore of great importance in the grouping of the Carnivora.

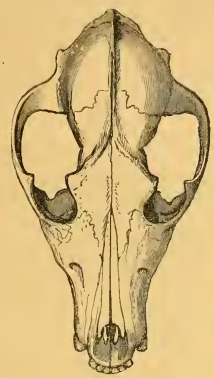


SIDE-VIEW OF WOLF'S SKULL.
The letters have the same significance as in the figure of the Lion's skull on p. 11.

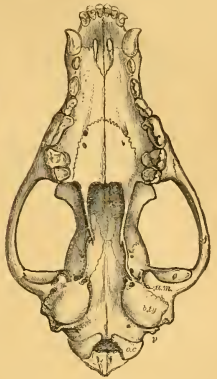
* *Canidæ.*

The great arches of bone beneath the eye are, in the Dog, nothing like so large as in the Cat, owing to the smaller size of the jaw muscles which pass under them. The snout, however, is much longer, in correspondence with the increased number of the teeth.

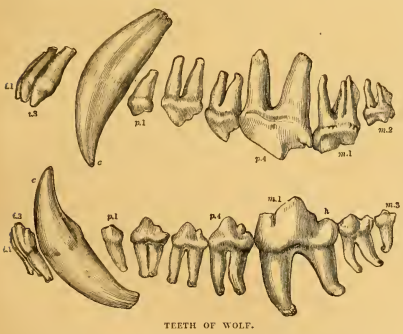
There will be no difficulty in making out the teeth of the Dog now we have studied those of the Cat. We shall find, as before, that there are in the small front bones of the upper jaw three teeth on each side, and the same number in the corresponding part of the lower jaw: these are, of course, the incisors. They are followed by the canines, or great eye teeth, of which, as in the Cat, there is one on each side of each jaw. After the canines, however, come no less than six teeth on each side of the upper jaw, and seven on each side of the lower. It is found that the first four of these are represented in the jaw of the young Dog by milk molars; therefore, as we explained in treating of the teeth in the Cat, these four are premolars, and the remaining three, molars. A likeness to what we find in the Cat exists in the fact that the last premolar of the upper jaw and the first molar of the lower jaw are very large teeth, and bite against one another. These are the *carnassials* of the respective jaws. Thus the dental formula of the Dog is—incisors, $\frac{3-3}{3-3}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{4-4}{4-4}$, molars, $\frac{2-2}{3-3} = 42$.



UPPER VIEW OF WOLF'S SKULL.



UNDER VIEW OF WOLF'S SKULL.



TEETH OF WOLF.

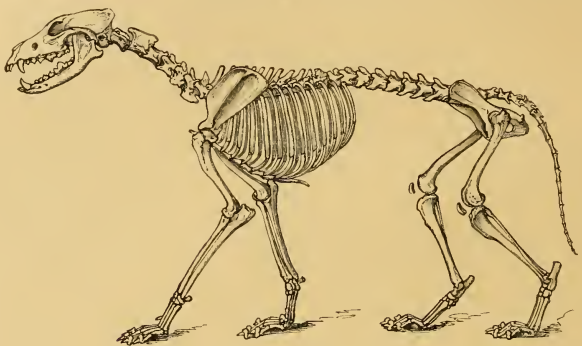
The letters have the same significance as in the figure of the Lion's teeth on p. 13, except h, the "heel" of the lower carnassial.

The form of the teeth, as well as their number, comes much nearer to that of an ordinary Mammal, or is much less specially carnivorous than in the Cats. The incisors are proportionally larger than in our first section; their crowns are distinctly divided into three cusps —a large central and two small lateral ones; and the outermost incisors of the upper jaw approach tolerably nearly in shape and size to the canines, being nearly half as long as the latter, and having almost lost their lateral cusps. The canines have much about the same form and relative size as in the Cat, as also have the premolars, except that the first of these, though smaller than its successor, is not so markedly so as in the Cats, while, on the other hand, the last (the carnassial) is proportionally larger.

But in the molars, or at least in all but the lower carnassial, we find something quite different, namely, an interesting approximation to the semi-herbivorous type of dentition of the Bears. Both

molars in the upper jaw, and the two last in the lower, have become *bonâ fide* "grinders." The scissor-like cutting edge has disappeared, and in place of it we have a hard crushing surface, raised into four cusps—two large external and two smaller internal ones. This has relation, of course, to the mixed character of the Dog's food. The sectorial molar of the lower jaw still, however, retains its distinctive characters; its crown has much the same shape as in the Cat, but in addition possesses an extra lobe, in the shape of a large heel-like process projecting from its hinder border, and formed by a modification of its posterior cusp.

The Dog family have, as a rule, longish legs. They walk on the tip of their toes, like the



SKELETON OF WOLF.

Cats; but unlike the latter, their claws are not retractile. Curious to relate, however, the elastic ligament by which the drawing back of the feline claw is effected is present, but in so feeble a condition as to be quite incapable of antagonising the great flexor muscles.

In consequence of this, the paw of a Dog is by no means such a perfect weapon as that of a Cat; and, as a matter of fact, the Dogs are distinguished from the Cats by their habit of always attacking the prey at once with their teeth, and never beginning the attack with a blow of the paw.

In the matter of internal anatomy, the Dog family differ from all other Carnivores in possessing a large "blind gut," or cæcum. The intestines, which are proportionally longer than a Cat's, are, as usual, divided into large and small, and, at the place where the large and small intestines join one another, there goes off a folded sac, communicating with the intestine at one end, but quite closed at the other, forming, in fact, a small *cul-de-sac*. The use of this curious appendage is not properly understood, nor why it should be so well developed in the Dog family, while it is very small indeed in Cats, and wholly absent in Bears.

No member of this family attains the size reached by some of the *Felidæ*, such as the Lion and Tiger, or some of the *Ursidæ*, such as the Grizzly or Polar Bear; the Mastiff is the largest of the tribe, no wild species of which is larger than an ordinary Shepherd's Dog.

THE DOMESTIC DOG.*

We have now to consider an animal which has more interest for us than any member of the animal kingdom, with the single exception of *Homo sapiens;* indeed, many people, if asked to name the creature which feels for them the most disinterested friendship, the most devoted love, and which

* *Canis familiaris.*

shows the most constant and untiring kindness and attention, would without hesitation name the humble Carnivore rather than the arrogant and self-asserting Primate. It was not his servants who recognised Ulysses on his return from his long voyage; it was not even his faithful Penelope; it was the old Dog Argus, who

> "——— soon as he perceived
> Long-lost Ulysses nigh, down fell his ears
> Clapp'd close, and with his tail glad sign he gave
> Of gratulation, impotent to rise
> And to approach his master as of old."

Where shall we find an instance of human devotion, unaltered and unalterable by death, greater than that recorded by our great Lake poet of the Dog whose ill-fated master was killed in passing Helvellyn?—

> "The Dog, which still was hovering nigh,
> Repeating the same timid cry,
> This Dog had been through three months' space,
> A dweller in that savage place.
> Yes, proof was plain, that since the day
> On which the traveller thus had died,
> The Dog had watched about the spot,
> Or by his master's side.
> How nourished here through such long time,
> He knows who gave that love sublime,
> And gave that strength of feeling, great
> Above all human estimate."

No animal has been so universally or so thoroughly domesticated as the Dog; in none have the moral and intellectual faculties been so largely developed; and there is certainly none which the human race could so ill spare. We might possibly, with a proper amount of practice, become vegetarians, and so do without our sheep and cattle, our pigs and poultry. The Cat we might easily dispense with, for she is, after all, a very passive sort of creature, and rarely condescends to express either emotion or affection, whatever her feelings may be; but to lose the Dog would be to lose a friend, and a friend so faithful and true that his loss would be a veritable plucking out of the right eye and a cutting off of the right hand. As Mr. Darwin observes: "It is scarcely possible to doubt that the love of man has become instinctive in the dog," which it can hardly be said to have done, as yet, in man!

Wherever man of any degree of civilisation is found, there the Dog is to be found too—everywhere invaluable, though often grossly and brutally ill-treated. In all probability, too, Dogs occur as true natives in all parts of the world, except in the Australian region—Australia, New Zealand, and the surrounding islands; in these places he has, in all probability, been introduced by man.

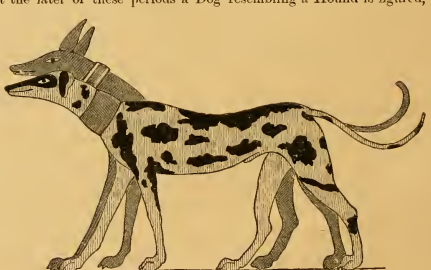
The likeness of the domestic Dog to his more immediate relatives is very close. Except in the want of obliquity in the eyes, and in the curling of the tail, so different to the straight "brush" of a Wolf or wild Dog, there is really no definite character which can be given as separating *Canis familiaris* from the wild species of the genus. Moreover, the difference between the varieties of the Dog itself is so great, that it is impossible to frame anything like a good definition which will include the Bulldog, the Greyhound, the Newfoundland, and the Terrier, and, at the same time, exclude the Dingo and the Bâansú. The one constant difference is the habit of barking, "which is almost universal with domesticated Dogs, and which does not characterise a single natural species of the family."

The Dog certainly took its origin at a very remote period, for we find undoubted evidence of his existence and regular domestication in the very earliest records. Among the early Hebrews, he seems to have been unknown, or rather, despised; and it strikes one as a most remarkable circumstance that this astute nation of shepherds should never have domesticated so useful an assistant. Possibly this is partly owing to the prejudice the grand old Theists of Palestine must have felt against an animal held in great veneration as an emblem of the Divine Being by the idolatrous Egyptians; and yet this objection can hardly have had much weight, as the Hebrews kept Oxen, animals which were regularly worshipped by the Egyptians. Throughout the Old and New Testaments the Dog is spoken of with scorn and contempt as "an unclean beast," so that probably the Israelites had

the misfortune only to know this friend of man in the character in which he now appears in Constantinople—as the common scavenger of the neighbourhood. The only instance in the Bible in which the Dog is mentioned as a domesticated animal is in that magnificent drama, the Book of Job, a poem of great antiquity, and very possibly not of Hebrew origin. The suffering patriarch, after recounting to his "friends" the greatness of his former prosperity, says: "But now they that are younger than I have me in derision, whose fathers I would have disdained to have set with the dogs of my flock." This passage is extremely remarkable, as showing at what an early period of the world's history the Dog was sufficiently domesticated to be capable of the arduous task of guarding Sheep—a task, the proper performance of which necessitates the total suspension of the true canine instinct, which is not to guard and protect the Sheep, but to worry and devour them.

The prejudice of the Jews against the Dog is shown at the present day by the Hindoos and by the Mahometans, with whom "Dog" is the greatest possible term of reproach, and who never think of the animal as anything but a semi-useful, degraded beast, good for nothing but to clear off the offal of the streets. Among many ancient nations, however, the Dog was held in great veneration, and was even worshipped as a god. In the passage—"Howbeit every nation made gods of their own . . . and the Avites made Nibhaz," * the word *Nibhaz* is supposed to signify *a barker*, and it is thought that this idol had the form of a Dog. "The Egyptians had several breeds of Dogs, some solely used for the chase, others admitted into the parlour, or selected as the companions of their walks; and some, as at the present day, selected for their peculiar ugliness. All were looked upon with veneration, and the death of a Dog was not only lamented as a misfortune, but was mourned by every member of the house in which it occurred."

It is certain that the Egyptians selected their Dogs in such a manner as to produce well-marked varieties, for, as Mr. Youatt states, "there are to be seen on the Egyptian temples representations of Dogs with long ears and broad muzzle, not unlike the old Talbot Hound." This is extremely interesting as showing at what an early period the Dog had been completely differentiated from other *Canidæ*, by acquiring definite characters, quite distinct from those of his wild relations. The Assyrians, too, had advanced considerably in the art of seizing upon important varieties in the structure of their Dogs, and perpetuating them as Hounds. Mr. Darwin informs us that an undoubted Mastiff of enormous size is figured on the tomb of Esar Haddon, about 640 B.C., and he goes on to say, "I have looked through the magnificent works of Lepsius and Rosellini, and on the monuments from the fourth to the twelfth dynasties (*i.e.*, from about 3400 B.C. to 2101 B.C.) several varieties of the Dog are represented; most of them are allied to Greyhounds. At the later of these periods a Dog resembling a Hound is figured, with drooping ears, but with a large back, and more pointed head than in our Hounds. There is, also, a Turnspit, with short and crooked legs, closely resembling the existing variety." †



GREYHOUNDS. (*From an Egyptian Monument.*)

Both the Greeks and Romans made much of the Dog, and among the latter, Greyhounds, Hounds, House Dogs, and Lap Dogs existed. Some of them are preserved in sculpture. The Greeks had a Dog closely resembling our Newfoundland, as is made certain from a piece of sculpture, "said to have been the favourite Dog of Alcibiades, and to have been the production of Myron, one of the most skilful artists of ancient times." Dogs "were sacrificed at certain periods by the Greeks and Romans to almost all their deities, and particularly to Mars, Pluto, and Pan, to Minerva, Proserpine, and Lucina, and also to the moon, because the Dog by his barking disturbed all charms and spells,

* 2 Kings xvii. 31.

† Darwin's "Animals and Plants under Domestication."

and frightened away all spectres and apparitions. The Greeks immolated many Dogs in honour of Hecate, because by their baying the phantoms of the lower world were disturbed. A great number of Dogs were also destroyed in Samothrace in honour of the same goddess. Dogs were periodically sacrificed in February, and also in April and in May; also to the goddess Rubigo, who presided over the corn, and the Bona Dea, whose mysterious rites were performed on Mount Aventine. The Dog Cerberus was supposed to be watching at the feet of Pluto, and a Dog and a youth were periodically sacrificed to that deity. The night when the capital had nearly been destroyed was annually celebrated by the cruel scourging of a Dog in the principal public places, even to the death of the animal."*

Homer, like the modern English, frequently uses the word "Dog" as an epithet of contempt—"thou Dog in forehead;" but the Dog was man's companion everywhere amongst those old Greeks. When the "God of the silver bow" strikes beasts and men with pestilence, it is said—

> "Mules first and Dogs he struck, but at themselves,
> Dispatching soon his bitter arrows keen,
> Smote them."

Yet, mixed with these friendly Dogs there were evidently Pariah Dogs; cowards are threatened thus:—

> "The Vulture's maw
> Shall have his carcase, and the Dogs his bones."

Two nobler breeds are also indicated, viz., Shepherd Dogs and Hounds:—

> "As Dogs that careful watch the fold by night,
> Hearing some wild beast in the woods, which Hounds
> And hunters with tumultuous clamour drive
> Down from the mountain-top, all sleep forego."

Homer also makes indubitable reference to another breed, viz., the Boarhound:—

> "As when Dogs and swains
> In prime of manhood, from all quarters rush
> Around a Boar, he from his thicket bolts,
> The bright tusk whetting in his crooked jaws;
> They press him on all sides, and from beneath
> Loud gnashings hear, yet firm, his threats defy."

But more ancient than any of these records are the evidences which prove the existence of the domestic Dog among the pre-historic savages of Northern Europe. In the Danish "kitchen-middens," or heaps of household refuse, piled up by the men of the newer stone period—a time when our Scandinavian forefathers used chipped or polished flints instead of metal for their weapons—are found bone-cuttings belonging to some species of the genus *Canis*. Along with these remains are some of the long bones of birds, all the other bones of the said birds being absent. Now it is known that the bird-bones here found are the very ones which Dogs cannot devour, while the absent ones are such as they can bolt with ease, and it has been ingeniously argued from this that the remains in question did really belong to a domestic Dog, as, if the animals to which they appertained had been Wolves, they would have made short work of the long bones as well as of the others. Other Dog-bones are found in Denmark in later periods. At the time when the flint knives were succeeded by bronze a large Dog existed, and at the time when iron was used one larger still. In Switzerland, during the newer stone period, a Dog existed, which is probably the oldest of which we have any record. It "partook of the character of our Hounds and Setters or Spaniels," and, in the matter of its skull, "was about equally remote from the Wolf and Jackal." This Dog, too, like its Danish contemporary, was succeeded in the bronze period by a larger variety. Thus we see that, at a time when our ancestors were living "in dens and caves of the earth," in a state of civilisation about equal to that of the African or Australian aborigines of the present day, the Dog was already systematically kept, and "selected," that is, any good varieties which appeared were taken note of, and kept up.

* Youatt: "The Dog."

We have mentioned above the common practice amongst the Greeks and Romans of offering Dogs as sacrifices to the numerous deities. The same custom was prevalent in early times in Scandinavia, where the Dog was often used as a sacrificial victim. Mr. Youatt says:—"Before Christianity was established among the Danes, on every ninth year, at the winter solstice, a monstrous sacrifice of ninety-nine Dogs was effected. In Sweden the sacrifice was still worse. On each of nine successive days ninety-nine Dogs were destroyed. This sacrifice of the Dog, however, gave way to one as numerous and as horrible. On every ninth year ninety-nine human victims were immolated, and the sons of the reigning tyrant among the rest, in order that the life of the monarch might be prolonged.

"On the other hand, the Dog was frequently the executioner; and, from an early period, whether in the course of war, or the mock administration of justice, thousands of poor wretches were torn to pieces by animals trained to that horrible purpose.

"As a counterpart to much of this, the ancient Hyrcanians may be mentioned, who lived near the Caspian sea, and who deemed it one of the strongest expressions of respect to leave the corpse of their deceased friends to be torn and devoured by Dogs. Every man was provided with a certain number of these animals, as a living tomb for himself at some future period, and these Dogs were remarkable for their fierceness."

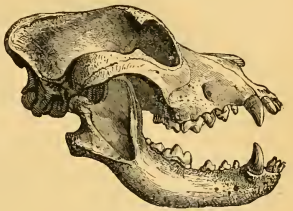
In the New World, the Dog is, or was, held as an object of adoration by many of the natives; and dog-worship seems to have been a more ancient *culte* than the sun-worship practised by the Mexicans. Humboldt informs us that "when the Inca Pachacutec, in his religious wars, conquered the Indians of Xanxa and Huanca (the present valley of Huancayo and Juuja), and compelled them by force to submit to the worship of the sun, he found that Dogs were made the objects of their adoration, and that the priests used the skulls of these animals as wind instruments. It would also appear that the flesh of this canine divinity was eaten by the believers. The veneration of Dogs in the valley of the Huancaya is probably the reason why the skulls, and even whole mummies, of these animals are sometimes found in the Huacas, or Peruvian graves of the most ancient period. Von Tschudi, the author of an admirable treatise on the *Fauna Peruana*, has examined these skulls, and believes them to belong to a peculiar species, which he calls *Canis ingæ*, and which is different from the European Dog. The Huancas are still, in derision, called 'dog-eaters' by the inhabitants of other provinces." Humboldt also tells us that "the Peruvian Dogs were made to play a singular part during eclipses of the moon, being beaten as long as the darkness continued." But he says nothing about the origin of so curious a custom.

An animal of such intelligence as the Dog, one so necessary to the welfare of man, and devoted to him by so many ties, is certain to have a number of curious superstitions current regarding him. An excellent account of some of the most curious of them is given by the Rev. J. Gardner.

"Among the Hyperborean tribes, with whom the Dog is reckoned a very valuable animal, it occupies a conspicuous place in their traditions, being considered—as, for instance, among the Eskimo, according to the accounts given by Franklin and Parry, and other Arctic navigators—as the father of the human family. The Chippewayan Indians had a tradition that they were sprung from a Dog; and hence they neither ate the flesh of that animal themselves, nor could they look with any other feeling than horror upon those nations who fed upon it. In all these cases, probably, the Dog is the symbol of the sun. A strange notion prevails among the Greenlanders that an eclipse is caused by the sun being pursued by his brother the moon. Accordingly, when this phenomenon takes place, the women take the Dogs by the ears, believing that, as these animals existed before man was created, they must have a more certain presentiment of the future than he has; and therefore, if they do not cry when their ears are pulled, it is an infallible sign that the world is about to be destroyed.

"The inhabitants of Japan have a superstitious regard for Dogs. Thus, we learn from Picart, in his 'Religious Ceremonies of all Nations,' 'The emperor who sat on the throne when Kaempfer resided in Japan was so extravagantly fond of them, that there has been a greater number of them in that kingdom ever since his reign (if we may depend on the veracity of this traveller) than in any other nation in the whole world. Every street is obliged to maintain a fixed and determinate number of them. They are quartered upon the inhabitants, and in case of sickness they are obliged to nurse and attend them. When they die, they are obliged to inter them in a decent manner in the

mountains and hills peculiarly appropriated for the interment of the people. It is looked upon as a capital crime not only to kill them, but barely to insult and treat them ill; and no one but the legal proprietor is allowed so much as to correct any of them. All this reverence and respect are owing to a celestial constellation which the Japanese call the Dog, under the influence whereof the aforesaid Emperor of Japan was born."

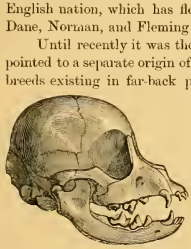


SKULL OF DOMESTIC DOG.

By most people the Dog is valued only during his life; his skin is not particularly valuable, and his flesh is little esteemed. This is by no means, however, the case everywhere. It is well known that the Chinese use the Dog as a regular article of food. Many of the North American tribes look upon an *entrée* of Dog as the greatest possible *bonne bouche* they can set before a stranger. Sir Leopold McClintock relates that, in the Sandwich Islands, he had most profuse apologies offered to him because there was no puppy to be had for a feast to which he was invited. The Eskimo, too, look upon a dish of young Dog as a great treat; and it is related that a Danish captain provided his friends with a feast of this kind, and when they *praised his mutton*, sent for the skin of the beast, and exhibited it to them! The Greeks and Romans also used the Dog as an article of diet, and many ancient writers, such as Galen and Hippocrates, represent Dog-meat as a highly desirable dish.

It is a remarkable circumstance, when we come to consider the probable origin of the Dog, that there is evidence of his domestication at such early periods, and by so many savage tribes in different parts of the world. As we have already seen, tame Dogs were possessed by savages in the neolithic, or newer stone period, by the Assyrians, Egyptians, Greeks, Romans, and the ancient inhabitants of North and South America, to say nothing of the numerous savage tribes at the present day, such as the Australians and the inhabitants of Guiana. Now the important question arises, had all these Dogs a common origin? Did the great neolithic Dog, the Sheep-dog of Job's time, the Grey-hounds, Turnspits, and Hounds of the Assyrians and Greeks, the divinely-honoured animals of Peru, and the supposed ancestors of the Eskimo and the Chippeways, spring from a single pair? or have various wild species of *Canidæ* been tamed and converted into true domestic Dogs, by different people in different parts of the world, these various species having since been crossed and re-crossed with one another and with their parent forms, until a species has been produced as complex in its origin as the English nation, which has flowing in its veins the blood of ancient Briton, Roman, Anglo-Saxon, Dane, Norman, and Fleming?

Until recently it was thought that all the evidence which could be brought to bear on the matter pointed to a separate origin of the Dog. It was argued, for instance, that as we have evidences of distinct breeds existing in far-back periods of the world's history, there was actually no time, prior to those periods, for him to have diverged from a savage ancestor, such as a Wolf or a Jackal. It was also thought highly unlikely that a number of primitive races of man should have separately tamed different wild *Canidæ*. Mr. Youatt, one of our best authorities on the Dog, writing in 1845, says: "This power of tracing back the Dog to the very earliest periods of history, and the fact that he then seemed to be as sagacious, as faithful, and as valuable as at the present day, strongly favours the opinion that he descended from no inferior and comparatively worthless animal; that he was not the progeny of the Wolf, the Jackal, or the Fox; but he was originally created, somewhat as we now find him, the associate and friend of man."



SKULL OF YOUNG DOG.

A few years ago there was no gainsaying arguments such as these, for then nearly everybody believed that the world was literally only six thousand years old, and that species were absolutely unchangeable. But Sir Charles Lyell and Mr. Darwin have "*changé tout cela.*" The argument from time fails utterly, and other facts have to be taken into consideration.

There is, first of all, the fact of identity of structure. There is absolutely no definition framable which will include all the varieties of the domestic Dog, and exclude all the wild species—none even which will include all the Dogs properly so called, both wild and tame, and at the same time exclude the Wolf and Jackal. It is the same as regards habits, instincts, mental endowments, &c. Wolves and Jackals can be and have been tamed. Domestic Dogs can become, and have again and again become, wild, and in no way better than true aborigines; and to assert that the Dog is not descended from a Jackal because his manners and customs are better, his tail more curly, and his voice a bark instead of a howl, is about as just as to assert that Englishmen cannot possibly be descended from ancient Britons, because they wear clothes instead of a coating of blue paint.

HARE INDIAN DOG.

With regard to the opinion that many races of men are not likely independently to have tamed wild *Canidæ*, there are certain facts which show that the exact contrary is the case. Savages in all parts of the world are fond of making pets of various kinds, and would have been certain to come across Wolf or Jackal pups in their wanderings through the woods. Then, again, as Mr. Darwin remarks, "At an extremely ancient period, when man first entered any country, the animals living there would have felt no instinctive or inherited fear of him, and would consequently have been tamed far more easily than at present. For instance, when the Falkland Islands were first visited by man, the large Wolf-like Dog (*Canis antarcticus*) fearlessly came to meet Byron's sailors, who, mistaking this ignorant curiosity for ferocity, ran into the water to avoid them. Even recently a man, by holding a piece of meat in one hand and a knife in the other, could sometimes stick them at night." Another important point is the readiness with which many wild species of *Canidæ* breed in confinement, so that the difficulty of perpetuating the newly-acquired characteristics of the tamed animal is, in this case, obviated. Furthermore, it is perfectly well known that savages at the present day do actually tame, and make useful to themselves, the wild Dogs of their particular countries: "the savages of Guiana

catch, and partially tame and use the whelps of the wild species of *Canis*, as do the savages of Australia those of the Dingo."

These statements certainly tend to show that there is no actual improbability in supposing that

ESKIMO DOGS.

many wild species of *Canidæ* have at different times, and by different nations, been tamed and gradually modified into true domestic Dogs. But the most significant fact bearing upon the multiple origin of the Dog is the often-occurring close resemblance between the domestic Dog of a savage tribe and the wild species of *Canis* inhabiting the same district. Of this most important circumstance there are far

too many instances to allow of its being looked upon as a mere coincidence. Sir John Richardson says: "The resemblance between the Wolves and the Dogs of those Indian nations who still preserve their ancient mode of life continues to be very remarkable, and it is nowhere more so than at the northern extremities of the Continent, the Eskimo Dogs being not only extremely like the Grey Wolves of the Arctic circle in form and colour, but also nearly equalling them in size. The Dog has generally a shorter tail than the Wolf, and carries it more frequently curled over the hip, but the latter practice is not totally unknown to the Wolf, although that animal, when under the observation of man, being generally apprehensive of danger or on the watch, seldom displays this mark of satisfaction." And again, "The resemblance between the northern Wolves and the domestic Dog of the Indians is so great, that the size and strength of the Wolf seem to be the only difference. I have more than once mistaken a band of Wolves for the Dogs of a party of Indians; and the howl of the animals of both species is prolonged so exactly in the same key, that even the practised ear of an Indian fails at times to discriminate them."

As the Eskimo and Indian Dogs resemble the North American Wolf (*C. lupus*), so the Dog of the Hare Indians, a very distinct breed (see below), resembles the Prairie Wolf (*C. latrans*). So great is this resemblance that Richardson says, "I could detect no marked difference in form except the smallness of its [the Dog's] cranium, nor in the fineness of its fur, and arrangement of its spots of colour. The length of the fur on the neck, back part of the cheeks, and top of the head, was the same in both species. It, in fact, bears the same resemblance to the Prairie Wolf that the Eskimo Dog does to the great Grey Wolf." Another observer remarks that, except in the matter of barking, there is no difference whatever between the black Wolf-dog of the Indians of Florida and the Wolves of the same country. The Dogs also breed readily with the wild animals they so closely resemble. The Indians often cross their Dogs with Wolves to improve the breed, and in South America the same process is resorted to between the domesticated and the wild Dogs.

The same phenomenon is seen in many kinds of Dog in the Old World. The Shepherd Dog of the plains of Hungary is white or reddish-brown, has a sharp nose, short erect ears, shaggy coat, and bushy tail, and so much resembles a Wolf, that Mr. Paget, who gives the description, says he has known a Hungarian mistake a Wolf for one of his own Dogs. There is also a close resemblance between some of the Indian Pariah Dogs and the Indian Wolf. Some of the domestic Dogs of Egypt, both at the present day and in the condition of mummies, closely resemble the Wolf of that country; "whereas the domestic Dogs of Nubia, and certain other mummied Dogs, have the closest relation to a wild species of the same country . . . which is only a form of the common Jackal." Dogs have, moreover, been known to cross with Jackals as well as with Wolves. Lastly, in Africa, some of the natives assert that their half-tamed Dogs are derived from Foxes; and the Dogs of the Bosjesman have a striking resemblance to the black-backed Jackal (*C. mesomelas*), which, as we shall see, is a South African variety.

These facts are so significant and so important that they in reality leave only one difficulty to be settled, and that is the question of voice. As we stated above, all domestic Dogs bark, while all wild *Canidæ* express their feelings only by howls. But the difficulty here is not so great as it seems. Some domestic Dogs left on the island of Juan Fernandez entirely lost the habit of barking in thirty-three years, and a few individuals removed after that period only re-acquired it very slowly; thus, domestic Dogs allowed to run wild forget how to bark. On the other hand, Jackals, wild Dogs, and Wolf-pups reared by bitches, readily acquire the habit. Thus the last stumbling-block in the argument disappears, and we are forced to agree with Mr. Darwin, from whom many of the above facts are taken,* that "it is highly probable that the domestic Dogs of the world have descended from two good species of Wolf (*C. lupus* and *C. latrans*), and from two or three other doubtful species of Wolves (namely, the European, Indian, and North African forms); from at least one or two South American Canine species; from several races or species of the Jackal; and perhaps from one or more extinct species;" and that the blood of these, "in some cases mingled together, flows in the veins of our domestic breeds."

There is no animal so interesting as the Dog for the study of the relation between man and the lower animals in the matter of instinct, reason, conscience, and the like. As no animal has been so

* Darwin, "Animals and Plants under Domestication."

thoroughly domesticated, and so systematically trained and educated, so none has developed in the same degree those higher endowments which are often considered as the exclusive attributes of humanity, such as reasoning power, a sense of right and wrong, of property, and of number.

For the study of instinct, it is impossible to find an animal in any way approaching to him for interest, for not only does he exhibit, to a wonderful degree, the instincts common to all the higher animals, but almost every kind of Dog possesses some special instinct, imparted from a remote ancestor, and absent, or nearly so, in other varieties. We may instance the mode of "pointing" game peculiar to the Pointer, the marvellous power of following scent of the Bloodhound or Foxhound, and the acute generalship of the Shepherd's Dog, who, with comparatively little teaching, guards, drives, and keeps together a whole flock of foolish animals, which, to the Dog mind, must seem intended by Providence to be worried and eaten. These special instincts we shall consider when we come to speak of the various breeds; but we must now say a few words on those instincts which are common to the whole species.

Unlike the Lion and Tiger, the male Dog takes no interest whatever in his offspring, who are taken care of during the weeks of their helplessness entirely by the mother. She, however, quite makes up for paternal neglect by the assiduity with which she tends and cares for her feeble offspring. It is one of the most touching, and, at the same time, almost amusing sights, to see a bitch with her first litter; how jealously she watches the blind, fat, slug-like little creatures. At first she will growl and snap even at her beloved master, if he approaches too near her treasures. When they have grown a little, how fussy she becomes when they are noticed; she will even drag them by the leg, one by one, upstairs, to exhibit their perfections! For several weeks this care continues, but by the time the pups have grown half as big as their mother, and can see and run about, her solicitude diminishes. She begins to quarrel with them over bones and other titbits, and, before long, takes no more notice of them than if they were the commonest stray Dogs in the street. It is this evaporation of mother-love which so distinguishes a Dog-parent from, at any rate, a great number of human parents.

Like most animals, the female Dog, if deprived of the natural objects of her affection, will lavish her care on almost any young and helpless thing with which she may be brought in contact.

Dr. Sclater,* whilst visiting the Zoological Gardens at Antwerp, in 1875, noticed a curious instance of the blindness of maternal love in a Dog. Among other objects of attraction were "three young Tiger-cubs, born in the Gardens on the 14th of October, 1873," that had been "most successfully foster-mothered by a large bitch."

We have stated that the male Dog is perfectly oblivious of his paternal duties; we have, however, met with one instance of a Dog, who, whatever may have been his qualities as a parent, discharged with great fidelity the part of guardian, and that, too, not to one of his own species, but to one of an alien and hostile race. This curious instance of canine affection was exhibited by a small male pet Spaniel, belonging to some friends of ours, who brought up a kitten. The *food*, certainly, was supplied by the family, but the brooding and tendance were done most faithfully. On warm days, the Dog would carry the kitten and lay it in the sun, choosing some snug place out of the wind, in the garden. The kitten, a female, lived to become a very beautiful Cat; but her unsuspecting innocence led to her death. Not fearing any of the Dog-kind, she made no attempts to escape from them, and was worried to death by a strange stray Dog.

One of the most striking circumstances with regard both to the general and the special instincts of the Dog, namely, those instincts common to the whole species, and those possessed by particular breeds, is the way in which they are transmitted from parent to child. The Pointer points the first time he is taken out; the Shepherd's Dog learns his duties with astonishingly little teaching. Not only are instincts transmitted in pure breeds, but in cross-breeds the special characteristics of both parents come out with the most marvellous accuracy. " . . It is known that a cross with a Bull-dog has affected for many generations the courage and obstinacy of Greyhounds; and a cross with a Greyhound has given a whole family of Shepherd-dogs a tendency to hunt Hares. Le Roy describes a Dog, whose great grandfather was a Wolf, and this Dog showed a trace of its wild parentage only in one way—by not coming in a straight line to his master when called." The tendency to attack Poultry, Sheep, &c.,

* "Proceedings of the Zoological Society," 1875.

"has been found incurable in Dogs which have been brought home as puppies from countries, such as Tierra del Fuego and Australia, where the savages do not keep these domestic animals. How rarely, on the other hand, do our civilised Dogs, even when quite young, require to be taught not to attack Poultry, Sheep, and Pigs!"*

A most astonishing account of an inherited mental peculiarity—an instinctive dislike—is related by Dr. Huggins, to whose researches the science of astronomy owes so much. He writes:—

"I possess an English Mastiff, by name Kepler, a son of the celebrated Turk, out of Venus. I brought the Dog, when six weeks old, from the stable in which he was born. The first time I took him out, he started back in alarm at the first butcher's shop he had ever seen. I soon found that he had a violent antipathy to butchers and butchers' shops. When six months old, a servant took him with her on an errand. At a short distance before coming to the house she had to pass a butcher's shop. The Dog threw himself down (being led with a string), and neither coaxing nor threats would make him pass the shop. The Dog was too heavy to be carried; and as a crowd collected, the servant had to return with the Dog more than a mile, and then go without him. This occurred about two years ago. The antipathy still continues, but the Dog will pass nearer to a shop than he formerly would. About two months ago, in a little book on Dogs published by Dean, I discovered that the same strange antipathy was shown by his father, Turk. I then wrote to Mr. Nicholls, the former owner of Turk, to ask him for any information he may have on the point. He replied—'I can say that the same antipathy exists in King (the sire of Turk), in Punch (son of Turk, out of Meg), and in Paris (son of Turk, out of Juno). Paris has the greatest antipathy, as he would hardly go into a street where a butcher's shop was, and would run away after passing it. When a cart with a butcher's man came into the place where the Dogs were kept, although they could not see him, they all were ready to break their chains. A master-butcher, dressed privately, called one evening on Paris's master to see the Dog. He had hardly entered the house before the Dog (though shut in) was so excited that he had to be put into a shed, and the butcher was forced to leave without seeing the Dog. The same Dog, at Hastings, made a spring at a gentleman who came into the hotel. The owner caught the Dog and apologised, and said he never knew him to do so before, except when a butcher came to his house. The gentleman at once said that was his business. So you see that they inherit these antipathies, and show a great deal of breed.'"†

A gentleman on reading this account of Dr. Huggins's Dog, wrote to say that he possessed a son of Sybil, daughter of Turk, who possessed the family antipathy in a marked degree, and another stated that he also possessed a grandson of the redoubted Mastiff, in whom the same peculiarity was developed. Thus we see that this most remarkable instinctive dread, arising no one knows how, existed not only in Dr. Huggins's Dog, but in his father, grandfather, brothers, and nephews! It was suggested, and it seems highly probable, that the feeling in this case first arose from the fact of some ancestor of the Turk family being ill-treated by a butcher; but it is quite possible that it may have arisen spontaneously. Boswell, in his life of Johnson, quotes the "Great Lexicographer" as attributing a similar dislike to butchers noticed in the Dogs of some savage countries, where the animal was used for food, not to horror at the butcher's cruelty, but merely to the smell of carnage.

A very remarkable *trait* in the Dog's character, which has undoubtedly become instinctive, and is consequently transmitted from generation to generation, is his love of human society. A well cared-for Dog will always prefer his master's company to that of his own kind, and will take any amount of trouble, and give up any amount of personal ease, that he may not be parted from him.

But, undoubtedly, the most wonderful canine instinct is the sense of direction, the power possessed by so many Dogs of finding their way back to an old and well-loved home, after being forcibly removed from it to a new place of abode. Instances are numerous in which Dogs, taken from their usual habitation, shut up in a basket, or by night, or in a swift railway train, have unerringly found their way back, greatly to the surprise of both their new and their old masters. Mr. Wallace has suggested that this was not a true case of instinct, but that the Dog, in all probability, found his way back by smell; that he, as it were, takes a note of every smell he passes—a stagnant pool here, a haystack there, a wayside inn, a stable, &c. &c.—and, remembering not only the smells, but the order in which he

* Darwin's "Origin of Species."

† Dr Huggins, *Nature*, Vol. VII.

MASTIFF.

smelt them, he follows the scent until he arrives at his destination. There is no doubt that the Dog's olfactory sense is wonderfully acute, but this is certainly carrying it too far. Moreover, as has been remarked, the direction of the wind was quite likely to change between the Dog's two journeys, and if one of his odoriferous landmarks happened to be movable, like a flock of Sheep, where would he be? But the one fact which completely disposes of the smell theory of the phenomenon is, that there is no evidence of a Dog's ever returning to his old home by the way he was taken from it; he invariably takes a different route, usually a short cut. For instance: "A Hound was sent by Charles Cobbe, Esq., from Newbridge, county Dublin, to Maynalty, county Meath, and thence, long afterwards, conveyed to Dublin. The Hound broke loose in Dublin, and the same morning made his way back to his old kennel at Newbridge, thus completing the third side of a triangle by a road he had never travelled in his life." Again, Mr. Romanes narrates the case of a Dog who, when taken by his master from Oban to Greenock, by sea, was grievously sea-sick. The next time the journey had to be made, the Dog, remembering his former trouble, jumped off the boat and disappeared. His master continued his voyage, and was greatly surprised, when he arrived at Greenock, to find the Dog waiting for him on the wharf! The distance from Oban to Greenock is fifty miles in a straight line, and this straight course the Dog is not likely to have taken, as his way would then have lain across mountains, a lake, and an arm of the sea. Thus it would seem that the Dog must have some sort of notion of direction, must possess, as it were, a special sense of the nature of a mariner's compass, and that, so far from his sense of locality being due in any way to power of smell, it is perhaps the most striking example of a pure instinct which it is possible to conceive.

We have not given many instances of instinct in the Dog, for it is a faculty of which no one denies the existence, but of reasoning power it is necessary to treat more fully, as many persons are disposed wholly to deny the presence of that faculty in all the lower animals, and to make it the exclusive prerogative of man. Every one who has kept a Dog must have seen it perform actions which, in a human being, would unhesitatingly be put down to reason; every one must have heard of cases in which a choice of two or more courses was presented to a Dog, and in which he has, after due reflection, chosen the best.

We are indebted to Mr. Hugh Miller, F.G.S., for a good instance of reasoning power in a Dog belonging to his brother, Captain Miller. This Dog, "Tara" by name, a Greyhound with a dash of Pointer, was one day taken out with a carriage for a run of forty miles. Now, it is estimated that a Dog, by his uncontrollable habit of "meandering," usually goes over about three times the ground of the horse or man he accompanies, so that on this occasion Tara must have run considerably over a hundred miles, and was in consequence rather done up when she reached home. She usually slept in the dining-room, whence she was always ejected at 7 A.M. by the housemaid who cleaned the room. On this occasion, however, no amount of persuasion could induce Tara to occupy her accustomed sleeping-place; she positively insisted upon following her master upstairs to his bedroom, where she evidently expected she could remain undisturbed for a good long rest, and where she did actually remain till 2 P.M. on the following day.

Another and more striking instance of the exercise of reasoning power is given in the *Quarterly Journal of Science* for April, 1876. It is there stated that a Newfoundland Dog was "sent across a stream to fetch a couple of hats, whilst his master and friend had gone on some distance. The Dog went after them, and the gentlemen saw him attempt to carry both hats, and fail, for the two were too much for him. Presently he paused in his endeavour, took a careful survey of the hats, discovered that one was larger than the other, put the small one in the larger, and took the latter in his teeth by the brim!"

In the face of facts such as these, the question as to whether Dogs possess the power of reasoning becomes merely one of words. No one would say that a human being who did as this Dog did acted from blind instinct. One can easily call to mind several persons of one's acquaintance, to whom it would be the height of presumption to deny the possession of reason, and who yet would never have thought of putting the hats one inside the other. It is related that the great Newton made, in his study door, a big hole for his Cat and a little one for the kitten. In doing this he showed far less exercise of reason than the Dog; and it is quite conceivable that if he had been sent to fetch the hats he would have brought them over separately! We shall give other instances of reason in the Dog when we

come to speak of conscience, cunning, revenge, &c., as exhibited by him. Any book of Dog-anecdotes will furnish the reader with many more, so that, on the whole, one is forced to the conclusion that, to prove the absence of reason in the Dog, one must argue something after this fashion:—Dogs often perform actions which, in man, would undoubtedly be attributed to reason. But man is the only member of the animal creation which possesses the reasoning faculty. Therefore, all actions in the Dog which simulate reason are, in reality, due to blind instinct. Therefore, Dogs do not possess the reasoning faculty. Which was to be demonstrated.

One of the most interesting points in the Dog's character, and one in which many of his human masters would do well to imitate him, is his teachableness. A good Dog may be taught almost anything, no matter how difficult or distasteful, or how foreign to his nature. And not only will he learn to do anything, but to understand anything, for there can be no doubt whatever that Dogs actually do understand what is said to them, in many cases, quite irrespectively of tone or gesture. Of course, with an ordinary Dog who has received no special and systematic training, it is the tone of his master's voice or his gestures which convey meanings to him, far more than the actual words; but with many Dogs, whose intelligence is great, and whose education has been thorough, this *acme* of culture is attained, and the animal does, undoubtedly, understand the actual words said to him. As an instance, we may mention the well-known case of "Sirrah," the Ettrick Shepherd's Dog, who wanted only the words "Sirrah, my man, they're a' awa'!" to proceed immediately in search of the missing flock. It is a matter of the commonest observation how soon even ordinary Dogs learn to understand certain words or phrases, such as "Rats!" "Cats!" "Set them off!" "Beg!" "Trust!" and so forth; and, although certainly in many of these cases tone and gesture have a great deal to do with the animal's comprehension, yet there can be no sort of doubt that a Dog of fair intelligence learns, after a time, to recognise the words, if spoken in the most ordinary tone of voice. The following account—a truly marvellous one—illustrates not only the most perfect understanding of words, but capacity for a high degree of education, great intelligence, extensive memory, and reasoning faculties of no mean order:—

"Two fine Dogs, of the Spanish breed, were introduced by M. Léonard, with the customary French *politesse*, the largest by the name of M. Philax, the other as M. Brac (or Spot). The former had been in training three, the latter two, years. They were in vigorous health, and having bowed very gracefully, seated themselves on the hearth-rug side by side. M. Léonard then gave a lively description of the means he had employed to develop the cerebral system in these animals—how, from having been fond of the chase, and ambitious of possessing the best trained Dogs, he had employed the usual course of training—how the conviction had been impressed on his mind that by gentle usage, and steady perseverance in inducing the animal to repeat again and again what was required, not only would the Dog be capable of performing that specific act, but that part of the brain which was brought into activity by the mental effort would become more largely developed, and hence a permanent increase of mental power be obtained.

"After this introduction, M. Léonard spoke to his Dogs in French, in his usual tone, and ordered one of them to walk, the other to lie down, to run, to gallop, halt, crouch, &c., which they performed as promptly and correctly as the most docile children. Then he directed them to go through the usual exercises of the *manège*, which they performed as well as the best trained ponies at Astley's.

"He next placed six cards of different colours on the floor, and, sitting with his back to the Dogs, directed one to pick up the blue card, and the other the white, &c., varying his orders rapidly, and speaking in such a manner that it was impossible the Dogs could have executed his commands if they had not had a perfect knowledge of the words. For instance, M. Léonard said, 'Philax, take the red card and give it to Brac, and, Brac, take the white card and give it to Philax.' The Dogs instantly did this, and exchanged cards with each other. He then said, 'Philax, put your card on the green, and Brac, put yours on the blue;' and this was instantly performed. Pieces of bread and meat were placed on the floor, with figured cards, and a variety of directions were given to the Dogs, so as to put their intelligence and obedience to a severe test. They brought the meat, bread, or cards, as commanded, but did not attempt to eat or to touch unless ordered. Philax was then ordered to bring a piece of meat and give it to Brac, and then Brac was told to give it back to Philax, who was to return it to its

place. Philax was next told he might bring a piece of bread and eat it; but, before he had time to swallow it, his master forbade him, and directed him to show that he had not disobeyed, and the Dog instantly protruded the crust between his lips.

"While many of the feats were being performed, M. Léonard snapped a whip violently, to prove that the animals were so completely under discipline, that they would not heed any interruption. After many other performances, M. Léonard invited a gentleman to play a game of dominoes with one of them. The younger and slighter Dog then seated himself on a chair at the table, and the writer and M. Léonard seated themselves opposite. Six dominoes were placed on their edges in the usual manner before the Dog, and a like number before the writer. The Dog, having a double number, took one up in his mouth, and put it in the middle of the table; the writer placed a corresponding piece on one side; the Dog immediately played another correctly, and so on until all the pieces were engaged. Other six dominoes were then given to each, and the writer intentionally played a wrong number. The Dog looked surprised, stared very earnestly at the writer, growled, and finally barked angrily. Finding that no notice was taken of his remonstrances, he pushed away the wrong domino with his nose, and took up a suitable one from his own pieces and placed it in its stead. The writer then played correctly; the Dog followed, and won the game. Not the slightest intimation could have been given by M. Léonard to the Dog. This mode of play must have been entirely the result of his own observation and judgment. It should be added that the performances were strictly private. The owner of the Dogs was a gentleman of independent fortune, and the instruction of his Dogs had been taken up merely as a curious and amusing investigation."*

To give another instance of a Dog understanding actual words:—A woman expressed aloud a wish that a certain Cat, who plagued her greatly, was dead. Her favourite Dog went out of the house, found the Cat in the garden, and immediately slew it! This is quite a parallel case to the story of Henry II. and Thomas à Becket.

Another very unequivocal instance is given us by Mr. Hugh Miller. Pompey, a black Retriever, belonging to a lady at Morningside, Edinburgh, could not be kept because he was perpetually damaging the neighbours' gardens. He was, therefore, sent to lodge with the family of an old servant, but there, too, he made his position untenable by fighting with the servant's own Dog. At last, it was agreed that there was no use in trying to cure Pompey of his bad habits; he was condemned to death, and the butcher was ordered to hang him on a certain day. The children, who loved the poor beast, despite his crimes, kept throwing their arms round his neck and saying, "Oh, poor Pompey, you're going to be hanged!" On the morning fixed for the execution Pompey disappeared, and kept clear until he imagined the storm had blown over. Another day was, therefore, fixed, but before that time the servant at whose house he was stopping mentioned Pompey's case to a lady, who obtained a reprieve, and adopted him herself. He behaved very well with his new mistress for some time, although for a full year after his rescue he was much depressed in spirits, and wore quite a hang-dog look. But after some years, there was a general change of servants in the house, and Pompey, who disliked strangers, bit one of the new-comers. His mistress—without meaning a threat—said to him, "Oh, Pompey, you'll be hanged after all!" whereupon Pompey decamped, and could by no means be heard of. At length, an advertisement in the *Scotsman* was answered by a gentleman, who stated that an ownerless Dog, of the description given, had been caught *changing trains* at Layton, Cumberland. Here he was detained, and, although at home rather averse to strangers, displayed at once extraordinary urbanity, and was soon a prime favourite. Evidently it was his intention to ingratiate himself with his new friends, that he might not be sent home and hanged. Subsequently, he was identified by a friend of his mistress's who was travelling in Cumberland, and sent home. Besides illustrating a Dog's knowledge of words, this anecdote furnishes a wonderful instance of acuteness, for this Dog knew nothing of the railway by which he travelled to Layton, except from having a short time before accompanied the cook to the station to see her off on a journey.

After finding that the Dog can understand what is said to him, one is always tempted to wish he could go one step further, and answer again, for to hear from a Dog's own lips his opinion on "men and things" would be an entertainment of no small interest. Attempts have been made to teach Dogs

* Youatt.

to speak, but as one might imagine with very partial success. A curious account of an attempt of this kind was communicated by the great philosopher Leibnitz to the French Academy.

"A little boy, a peasant's son, imagined that he perceived in the Dog's voice an indistinct resemblance to certain words, and therefore took it into his head to teach him to speak. For this purpose he spared neither time nor pains with his pupil, who was about three years old when his learned education commenced, and in process of time he was able to articulate no fewer than thirty distinct words. He was, however, somewhat of a truant, and did not very willingly exert his talent, and was rather pressed than otherwise into the service of literature. It was necessary that the words should be pronounced to him each time, and then he repeated them after his preceptor. Leibnitz attests that he heard the animal talk in this way, and the French Academicians add, that unless they had received the testimony of so celebrated a person they would scarcely have dared to report the circumstance. It took place in Mesnia, in Saxony." *

But "actions speak louder than words," and although the Dog is not gifted with the power of

BLACK RETRIEVER.

articulate speech, he is yet capable of expressing his feelings by look and gesture as eloquently as most people. It is altogether wonderful to see how a Dog's whole expression and demeanour are changed by a word or look either of praise or blame. The eye, the mouth, the ear, the tail, the whole trunk, all are called into requisition, and together speak a language which is unmistakable. Mr. Darwin gives a most interesting account of the mode of expression of two opposite states of mind in the Dog; an account which, like everything written by the same author, leaves nothing to be desired for clearness and accuracy.

"When a Dog approaches a strange Dog or man in a savage or hostile frame of mind, he walks upright and very stiffly; his head is slightly raised, or not much lowered, the tail is held erect and quite rigid; the hairs bristle, especially along the neck and back; the pricked ears are directed forwards, and the eyes have a fixed stare. These actions follow from the Dog's intention to attack his enemy, and are thus to a large extent intelligible. As he prepares to spring, with a savage growl, on his enemy, the canine teeth are uncovered, and the ears are pressed close backwards on the head. Let us now suppose that the Dog suddenly discovers that the man whom he is approaching is not a stranger, but his master; and let it be observed how completely and instantaneously his whole bearing is reversed.

* Youatt.

Instead of walking upright, the body sinks downwards, or even crouches, and is thrown into flexuous movements; his tail, instead of being held stiff and upright, is lowered and wagged from side to side; his hair instantly becomes smooth; his ears are depressed and drawn backwards, but not closely to the head; and his lips hang loosely. From the drawing back of the ears the eyelids become elongated, and the eyes no longer appear round and staring."

And again, "when a Dog is on the point of springing on his antagonist, he utters a savage growl; the ears are pressed closely backwards, and the upper lip is retracted out of the way of his teeth, especially of his canines. . . . If a Dog only snarls at another, the lip is generally retracted on one side alone, namely, towards his enemy."

"The feeling of affection of a Dog towards his master is combined with a strong sense of submission, which is akin to fear. Hence Dogs not only lower their bodies and crouch a little as they approach their masters, but sometimes throw themselves on the ground, with their bellies upwards. This is a movement as completely opposite as is possible to any show of resistance. . . . A pleasurable and excited state of mind, associated with affection, is exhibited by some Dogs in a very peculiar manner, namely, by grinning."*

It is extremely interesting to consider the means by which these various expressive movements are produced. If the skin be removed from the head of a Dog, there will be seen, lying beneath it, a quantity of red flesh, intermixed with a good deal of fat and fibrous substance. If this latter be carefully dissected away, the red flesh will be seen to resolve itself into a number of *muscles*, very definitely arranged, and each one designed for some special movement. There are, first of all, muscles which move the eye. One set of fibres closely encircle the aperture of the eyelids, and, when they act, close the eye, either entirely, as in actual sleep, or partially, as in that half sleepy state a Dog loves to be in on a hot afternoon, or before a blazing fire. Another set of eye muscles have an entirely different action to these. They radiate from the eyelids to the surrounding parts of the head, and when they act, "draw back the eyelids from the eyeball, and give a sparkling fierceness to the eye." From this reason Sir Charles Bell, who first described them, called them *scintillantes*, or sparkling muscles. The ears have a number of muscular bands attached to them, some drawing them forwards, some backwards, others sideways. These are, therefore, highly important muscles, for a Dog hardly passes a moment without moving his ears. We ourselves possess representatives of these muscles, but in an entirely useless state in most persons, very few having the power of moving their ears. Other very important muscles pass from one of the face bones in front of the eye, and are attached to the lip just above the canine teeth. When these act, they draw the lips back from those teeth, thus baring the Dog's chief weapon, and producing a snarl; they are, therefore, called the *ringentes*, or snarling muscles; and one has only to irritate a Dog to see their effect in altering the animal's expression. Lastly, there are muscles which draw back the corners of the mouth and produce a sort of grin, an action which seems to be almost normal in the Wolf, but which is also frequently seen in Dogs. It will be readily observed how important these muscles are, and how every expressive look in a Dog's countenance can be referred to the action of one or more of them.

MUSCLES OF DOG'S HEAD. (*After Sir C. Bell.*)

o, Circular muscle round the eyelids; *b*, *d*, scintillantes; *f*, *g*, *k*, muscles of the ear; *n*, *h*, ringentes; *m*, circular fibres of the mouth; *o*, muscle drawing back the angle of the mouth; *a*, cutaneous muscle, for moving the skin of the neck.

There can be no doubt that Dogs are perfectly capable of communicating their thoughts to one another, and of understanding one another's meaning as well as that of their masters. One often sees

* Darwin's "Expression of the Emotions."

two Dogs, after a friendly sniff, carry on a small conversation, before trotting on their ways, evidently quite as fond of a little chat as Burns's celebrated "twa Dogs," who

> "Foregather'd ance upon a time
> * * *
> Nae doubt but they were fain o' ither,
> An' unco pack and thick thegither;
> Wi' social nose whyles snuff'd and snowkit;
> Whyles mice and moudieworts * they howkit;
> Whyles scour'd awa in lang excursion,
> An' worry'd ither in diversion;
> Until wi' daffin weary grown,
> Upon a knowe they sat them down,
> And there began a lang digression
> About the lords o' the creation."

The method of hunting in packs adopted by wild Dogs is an undoubted proof of the faculty of combining together for a definite end, a number of animals agreeing to hunt a quarry, which one alone would be powerless against. But there are many instances of civilised Dogs concocting plans in the cleverest way, and carrying them out with a care and circumspection perfectly wonderful in a "dumb animal." For instance, Mr. Romanes says:—"A small Skye and a large Mongrel were in the habit of hunting Hares and Rabbits upon their own account, the small Dog having a good nose, and the large one great fleetness. These qualities they combined in the most advantageous manner, the Terrier driving the game from the cover towards his fleet-footed companion, which was waiting for it outside." The same gentleman gives another and still more curious instance:—

"A friend of mine in this neighbourhood had a small Terrier and a large Newfoundland. One day a shepherd called upon him to say that his Dogs had been seen worrying Sheep the night before. The gentleman said there must be some mistake, as the Newfoundland had not been unchained. A few days afterwards the shepherd again called with the same complaint, vehemently asserting that he was positive as to the identity of the Dogs. Consequently, the owner set one watch upon the kennel, and another outside the sheep enclosure, directing them (in consequence of what the shepherd had told him) not to interfere with the actions of the Dogs. After this had been done for several nights in succession, the small Dog was observed to come at day-dawn to the place where the large one was chained. The latter immediately slipped his collar, and the two animals made straight for the Sheep. Upon arriving at the enclosure, the Newfoundland concealed himself behind a hedge, while the Terrier drove the Sheep towards his ambush, and the fate of one of them was quickly sealed. When their breakfast was finished, the Dogs returned home, and the large one, thrusting his head into his collar, lay down again as though nothing had happened. Why this animal should have chosen to hunt by stratagem prey which he could so easily have run down I cannot suggest; but there is little doubt that so wise a Dog must have had some good reason."

In another case we have met with, a "solemn league and covenant" was made, for purposes of offence and defence, between a Dog and a Cat. A Blenheim Spaniel was taken to a strange house, and, shortly after his arrival, was attacked and severely scratched by the two Cats living there. The Spaniel was no match for both antagonists at once, and so judiciously beat a retreat into the garden. He there met with a Cat belonging to the gardener, and succeeded in making friends with her and prevailing on her to join with him against his cruel enemies. The two allies then went into the house, and finding one of the victorious Cats alone, attacked and defeated her. Shortly after she was put to flight, victor number two entered the room; she was also presently attacked and routed with great loss by the allied forces, who were thus left masters of the field. The narrator of this tale goes on to state that the Spaniel remained ever afterwards on terms of the firmest friendship with his feline helper.

It is a subject of great interest to consider which of the virtues and vices of man himself are exhibited by the Dog. We will take, first, his good qualities, and then shall "follow his vices—close at the heels of his virtues;" so that we may see how many of both he can be found to possess.

First, and most important of all, is a clear sense of right and wrong, without which no moral

* Moles.

advancement is possible. That nearly all Dogs have this sense, and that many possess it in a very marked degree, there can be no doubt. Several instances of this faculty are given by the author we have already quoted, Mr. G. J. Romanes,* who writes of a little Dog in his possession :—

"For a long time this Terrier was the only canine pet I had. One day, however, I brought home a large Dog, and chained him up outside. The jealousy of the Terrier towards the new-comer was extreme. Indeed, I never before knew that jealousy in an animal could arrive at such a pitch; but as it would occupy too much space to enter into details, it will be enough to say that I really think nothing that could have befallen this Terrier would have pleased him so much as would any happy accident by which he might well get rid of his rival. Well, a few nights after the new Dog had arrived, the Terrier was, as usual, sleeping in my bed-room. About one o'clock in the morning he began to bark and scream very loudly, and upon my waking up and telling him to be quiet, he ran between the bed and the window in a most excited manner, jumping on and off the toilette-table after

ITALIAN GREYHOUND.

each journey, as much as to say: 'Get up quickly; you have no idea of what shocking things are going on outside!' Accordingly I got up and was surprised to see the large Dog careering down the road: he had broken loose, and, being wild with fear at finding himself alone in a strange place, was running he knew not whither. Of course I went out as soon as possible, and after about half-an-hour's work succeeded in capturing the runaway. I then brought him into the house and chained him up in the hall; after which I fed and caressed him, with the view of restoring his peace of mind. During all this time the Terrier had remained in my bed-room, and, although he heard the feeding and caressing process going on down-stairs, this was the only time I ever knew him fail to attack the large Dog when it was taken into the house. Upon my re-entering the bed-room, and before I had said anything, the Terrier met me with certain indescribable grinnings and prancings, which he always used to perform when conscious of having been a particularly good Dog. Now, I consider the whole of this episode a very remarkable instance in an animal of action prompted by a sense of *duty*. No other motive than the voice of conscience can here be assigned for what the Terrier did: even his strong jealousy of the large Dog gave way before the yet stronger dread he had of the remorse he knew he should have to suffer if next day he saw me distressed at a loss which it had been in his

* *Quarterly Journal of Science*, April, 1876.

GREYHOUND.

power to prevent. What makes the case more striking is, that this was the only occasion during the many years he slept in my bed-room that the Terrier disturbed me in the night-time. Indeed, the scrupulous care with which he avoided making the least noise while I was asleep, or pretending to be asleep, was quite touching: even the sight of a Cat outside, which at any other time rendered him frantic, only causing him to tremble violently with suppressed emotion, when he had reason to suppose that I was not awake. If I overslept myself, however, he used to jump upon the bed and push my shoulder gently with his paw.

"The following instance is likewise very instructive. I must premise that the Terrier in question far surpassed any animal or human being I ever knew in the keen sensitiveness of his feelings, and that he was never beaten in his life. Well, one day he was shut up in a room by himself, while everybody else in the house where he was went out. Seeing his friends from the window as they departed, the Terrier appears to have been overcome by a paroxysm of rage, for when I returned I found that he had torn all the bottoms of the window-curtains to shreds. When I first opened the door he jumped about as Dogs in general do under similar circumstances, having apparently forgotten, in his joy at seeing me, the damage he had done. But when, without speaking, I picked up one of the torn shreds of the curtains, the Terrier gave a howl, and rushing out of the room, ran up-stairs screaming as loudly as he was able. The only interpretation I can assign to this conduct is, that his former fit of passion having subsided, the Dog was sorry at having done what he knew would annoy me; and not being able to endure in my presence the remorse of his smitten conscience, he ran to the farthest corner of the house, crying *peccavi* in the language of his nature.

"I had had this Dog for several years, and had never—even in his puppyhood—known him to steal. On the contrary, he used to make an excellent guard to protect property from other animals, servants, &c., even though these were his best friends. Nevertheless, on one occasion he was very hungry, and in the room where I was reading and he was sitting there was, within easy reach, a savoury mutton chop. I was greatly surprised to see him stealthily remove this chop and take it under a sofa. However, I pretended not to observe what had occurred, and waited to see what would happen next. For fully a quarter of an hour this Terrier remained under the sofa without making a sound, but doubtless enduring an agony of contending feelings. Eventually, however, conscience came off victorious, for, emerging from his place of concealment, and carrying in his mouth the stolen chop, he came across the room and laid the tempting morsel at my feet. The moment he dropped the stolen property he bolted again under the sofa, and from this retreat no coaxing could charm him for several hours afterwards. Moreover, when during that time he was spoken to or patted, he always turned away his head in a ludicrously conscience-stricken manner. Altogether, I do not think it would be possible to imagine a more satisfactory exhibition of conscience by an animal than this; for it must be remembered, as already stated, that the particular animal in question was never beaten in its life."

That extreme sensitiveness, so often an attribute of the highest kinds of mind, was developed to an extraordinary degree in this wonderful Terrier. His owner says:—"A reproachful word or look from me, when it seemed to him that occasion required it, was enough to make this Dog miserable for a whole day. I do not know what would have happened had I ventured to strike him; but once, when I was away from home, a friend used to take him out every day for a walk in the park. He always enjoyed his walks very much, and was now wholly dependent on this gentleman for obtaining them. (He was once stolen in London, through the complicity of my servants, and never after that would he go out by himself, or with any one whom he knew to be a servant.) Nevertheless, one day, while he was amusing himself with another Dog in the park, my friend, in order to persuade him to follow, struck him with a glove. The Terrier looked up at his face with an astonished and indignant gaze, deliberately turned round, and trotted home. Next day he went out with my friend as before, but after he had gone a short distance, he looked up at his face significantly, and again trotted home with a dignified air. After this, my friend could never induce the Terrier to go out with him again. It is remarkable, also, that this animal's sensitiveness was not only of a selfish kind, but extended itself in sympathy for others. Whenever he saw a man striking a Dog, whether in the house or outside, near at hand or at a distance, he used to rush to the protection of his fellow, snarling and snapping in a most threatening way. Again, when driving with me in a dog-cart, he always used to seize the sleeve of my coat every time I touched the Horse with the whip."

Sensitiveness such as this generally goes along with the keenest susceptibility to ridicule; and here, again, the same Dog showed a dislike of being laughed at which is amusingly human, as is also the clever trick by which he tried to escape the gibes which were entering so deeply into his soul.

"The Terrier used to be very fond of catching flies upon the window-panes, and if ridiculed when unsuccessful, he was evidently much annoyed. On one occasion, in order to see what he would do, I purposely laughed immoderately every time he failed. It so happened that he did so several times in succession—partly, I believe, in consequence of my laughing; and eventually he became so distressed that he positively *pretended* to catch the fly, going through all the appropriate actions with his lips and tongue, and afterwards rubbing the ground with his neck as if to kill the victim; he then looked up at me with a triumphant air of success. So well was the whole process simulated, that I should have been quite deceived had I not seen that the fly was still upon the window. Accordingly I drew his attention to this fact, as well as to the absence of anything upon the floor; and when he saw that his hypocrisy had been detected, he slunk away under some furniture, evidently much ashamed of himself."

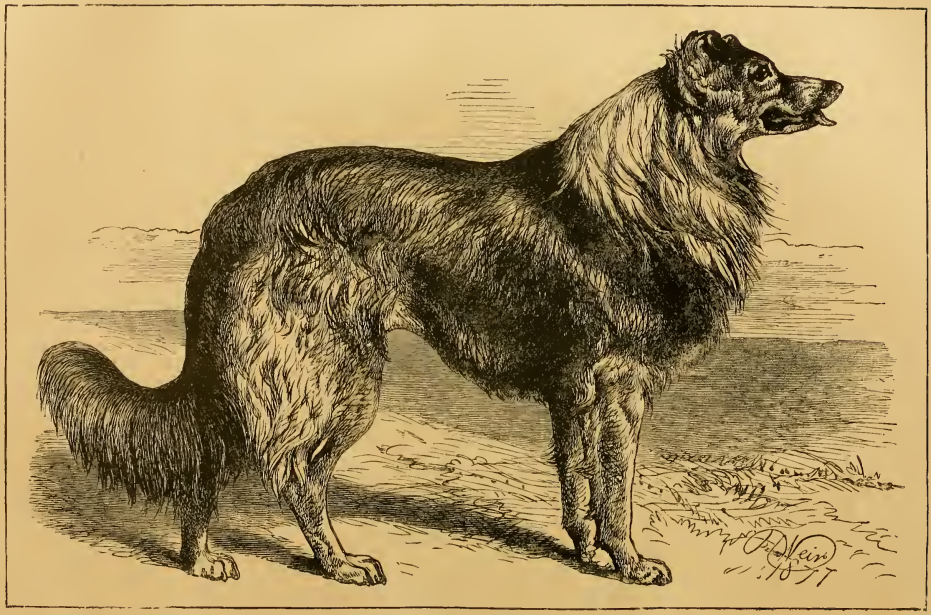
Honesty is a virtue very commonly developed in good Dogs, and instances of it are numerous. In the family of a friend of ours there is a large Retriever—a long-faced, Puritanical-looking Dog—which, when the temptation to steal is ready to overpower him, will, to keep his virtue untarnished, turn his back upon the longed-for morsel, solemnly looking in the opposite direction. Evidently, like Coleridge's "holy hermit," he "prays where he does sit," and thus overcomes the temptation. But, as usual, the best anecdote is given by Mr. Romanes, again *apropos* of his wonderful Terrier.

"I have seen this Dog escort a Donkey, which had baskets on its back filled with apples. Although the Dog did not know that he was being observed by anybody, he did his duty with the utmost faithfulness; for every time the Donkey turned back its head to take an apple out of the baskets the Dog snapped at its nose; and such was his watchfulness, that, although his companion was keenly desirous of tasting some of the fruit, he never allowed him to get a single apple during the half-hour they were left together. I have also seen this Terrier protecting meat from other Terriers (his sons) which lived in the same house with him, and with which he was on the best of terms. More curious still, I have seen him seize my wristbands while they were being worn by a friend to whom I had temporarily lent them."

In some Dogs, as in many people, honesty does not spring from high principle, but from mere conventionality. Actual dishonesty, too, is the commonest vice of untrained or badly-trained Dogs. It is, however, comparatively rare to meet with Dogs whose thefts are of a really artistic nature. Two of the best instances of this are furnished by Sir Walter Scott,* who gives a most interesting account of a Shepherd's Dog and a Spaniel, both of whom had a perfect talent for thieving; they were not only afflicted with kleptomania in a high degree, but showed as much talent in the performance of their equivocal deeds as the most prominent member of the "swell mob."

"I have heard of a sheep-stealer who had rendered his Dog so skilful an accomplice in his nefarious traffic, that he used to send him out to commit acts of felony by himself, and had even contrived to impress on the poor cur the caution that he should not, on such occasions, seem even to recognise his master if they met accidentally. There were several instances of this dexterity, but especially those which occurred in the celebrated case of Murdison and Millar in 1773. These persons, a sheep-farmer and his shepherd, settled in the vale of Tweed, commenced and carried on for some time an extensive system of devastation on the flocks of their neighbours. A Dog belonging to Millar was so well trained that he had only to show him during the day the parcel of Sheep which he desired to have, and when dismissed at night for the purpose, Yarrow went right to the pasture where the flock had fed, and carried off the quantity shown to him. He then drove them before him by the most secret paths to Murdison's farm, where the dishonest master and servant were in readiness to receive the booty. Two things were remarkable. In the first place, that if the Dog, when thus dishonestly employed, actually met his master, he observed great caution in recognising him, as if he had been afraid of bringing him under suspicion; secondly, that he showed a distinct sense that the illegal transactions in which he was engaged were not of a nature to endure daylight. The Sheep which he

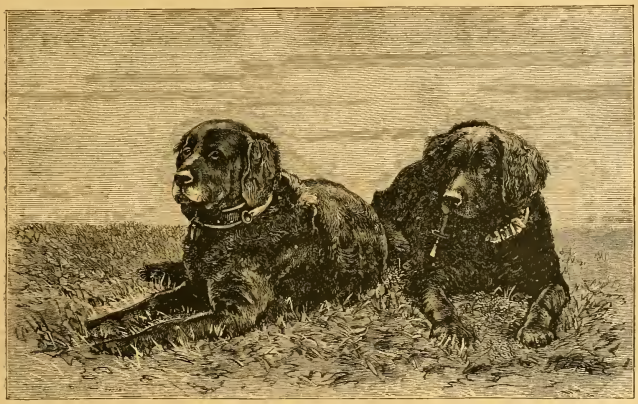
* "St. Ronan's Well."



COLLEY, OR SHEEP DOG.

was directed to drive were often reluctant to leave their own pastures, and sometimes the intervention of rivers or other obstacles made their progress peculiarly difficult. On such occasions, Yarrow continued his efforts to drive his plunder forward until the day began to dawn, a signal which, he conceived, rendered it necessary for him to desert his spoil, and slink homeward by a circuitous road. It is generally said this accomplished Dog was hanged along with his master; but the truth is, he survived him long, in the service of a man in Leithen: yet was said afterwards to have shown little of the wonderful instinct exhibited in the service of Millar.

"Another instance of similar sagacity a friend of mine discovered in a beautiful little Spaniel, which he had purchased from a dealer in the canine race. When he entered a shop, he was not long in observing that his little companion made it a rule to follow at some interval, and to estrange itself from his master so much as to appear totally unconnected with him. And when he left the shop, it



NEWFOUNDLAND DOGS.

was the Dog's custom to remain behind him till it could find an opportunity of seizing a pair of gloves, or silk stockings, or some similar property, which it brought to its master. The poor fellow probably saved its life by falling into the hands of an honest man."

Equally good is the account given by Mr. Youatt of a pair of canine house-lifters, whose talents were really pre-eminent. One is almost tempted to wonder if an iron safe with all the most recent improvements would have been proof against their attacks.

"The writer of this work had a brace of Greyhounds as arrant thieves as ever lived. They would now and then steal into the cooking-room belonging to the kennel, lift the lid from the boiler, and, if any portion of the joint or piece of meat projected above the water, suddenly seize it, and before there was time for them to feel much of its heat, contrive to whirl it on the floor, and eat it at their leisure as it got cold. In order to prevent this, the top of the boiler was secured by an iron rod passing under its handle, and tied to the handle of the boiler on each side; but not many days passed ere they discovered that they could gnaw the cords asunder, and displace the rod, and fish out the meat as before. Small chains were then substituted for the cords, and the meat was cooked in safety for nearly a week, when they found that, by rearing themselves on their hind legs, and applying their united strength towards the top of the boiler, they could lift it out of its bed, and roll it along the floor, and

so get at the broth, although the meat was out of their reach. The man who looked after them expressed himself heartily glad when they were gone; for he said he was often afraid to go into the kennel, and was sure they were devils and not Dogs."

The foregoing Dogs were all dishonest in a tolerably open sort of way, and are comparable to human burglars and shop-lifters; but the animal of whom the following tale is told disdained plain dealing, and went in for something akin to the well-known "confidence dodge," by which so many unsuspecting countrymen are every year taken in by London sharpers:—

"I once, under somewhat singular circumstances, made the acquaintance of a Dog, as arrant a vagabond and impostor as ever ran on four legs, but whose shortcomings were, I feel convinced, occasioned by circumstances entirely beyond his control. He was above the medium size, and of handsome proportions, except for one or two blemishes. There was an air of superior breeding about the animal; his coat was silky and genteel, and his bright eyes beamed with intelligence. Owing, however, to an accident of birth, a taint of the most objectionable cur kind had crept into his composition. It announced itself in distorting to baudiness his otherwise symmetrical fore-legs, and in a shapeless, club-like tail, which usurped the place of a wavy, graceful terminal appendage such as would have been his had not his breed been marred. A close observer might have remarked, as well as the peculiarities mentioned, a raffish drooping of the left eyelid and an up-curving of the upper lip on the right side, as though the animal had been used to pot-house company, and they had taught him the trick of holding a short pipe there. But, on the whole, and at a cursory glance, he was quite a nice-looking Dog.

"The first occasion of our meeting was very late one wintry night, when the snow lay half a foot deep on the street pavement. I cannot say if he first caught sight of me or I of him, for he was crouched in the shadow of a lamp-post, seemingly on the chance of there coming that way a compassionate pedestrian who might be induced to give him a night's lodging. Our eyes met, and had I been a long-lost relative he could not have been more suddenly inspired with joy. He bounded to his feet, and proclaimed his good-luck in tones that must have awakened all the babies in the neighbourhood. I quickened my step, but he appeared to regard this as a friendly response to his friskiness, and he barked the louder. For peace' and quietness' sake I adjured him as 'Good Dog.' That did the business. He had no objection to trotting soberly by my side on that understanding, and so together we arrived at my domicile.

"It was altogether against the rules of the establishment to admit strange Dogs, but under such circumstances what could I do? His genteel appearance pleaded for him. The mere fact of his having, like a blundering, stupid, honest tyke, jumped to the conclusion that I looked just the sort of man to befriend a houseless Dog, spoke in his favour. Every one was in bed as I opened the door with my latch-key, and not too deeply to compromise myself I pointed out to my canine intruder that his place for the night was the door-mat. I went down-stairs and searched for scraps, and got him together a tolerably good supper, and left him perfectly comfortable.

"I cannot believe that at that time he had it in his mind to abuse my confidence, or to act towards me in any way the reverse of honourable. It must have been that unfortunate one-eighth of cur that, made bold by beef-bones, rose against the animal's better nature, and conquered it. Anyhow, when the outer door was opened to the newspaper-boy next morning, the servant was scared by the spectacle of a Dog taking the whole flight of steps at a leap, and making off with part of a leg of pork in its mouth. The villain had feloniously extracted it from the pantry, which I had inadvertently left open when I went foraging for him. Besides the pork he had carried off, he had helped himself during the night to a small steak-pie, about a pound of fresh butter, and a fine rasher of ham. I had but little expectation of encountering the canine traitor ever again; but I did so. About a week after, at dead of night, and in the pouring rain, once more I made out his crouching figure in the shadow of the identical lamp-post. Again our eyes met, and, as on the previous occasion, he instantly leapt to his feet. Not to cut capers about me. However, his guilty fears did not make of him a faltering, trembling coward. He took in the whole situation at a glance, including my vengefully-grasped umbrella, and, with one brisk bark of derision, made off at a speed which quickly carried him out of sight. Since then I have frequently encountered him, but it has been in the busy streets at daytime, but he does not run away. If he can avoid my eye he does so. If he cannot—and with his guilt

haunting him I imagine it is not easy to do so—he assumes a puzzled expression of countenance, as though half convinced he has seen me before, though when and under what circumstances he could not say though his life depended on it."*

Another very good instance of cunning, produced by a long course of back-slum life and manners, is given by the writer from whom the foregoing anecdote is taken, respecting "a Dog—a low-looking villain, blind of one eye, and, in consequence of his nefarious propensities, with never more than three sound legs to run on, who haunts the neighbourhood of Drury Lane. Nobody owns the brute, but he has contrived to scrape acquaintance with a kind-hearted cheesemonger, who keeps a shop there. I have the worthy tradesman's own word for it that he always knows when the officer on the look-out for vagrant Dogs is about by the sudden appearance of Tinker and his peculiar behaviour. At ordinary times disdaining to be anything better than a Dog of the streets, his custom is to salute the cheesemonger from the pavement, and by a bark and a wag of his stump of a tail solicit an unconsidered trifle of bone or bacon-rind; but on the special occasion alluded to his tactics are quite different. He enters the shop with a sober and business-like air, and lies down on a mat by the parlour-door, with paws extended and his tail beating a contented tattoo on the floor, as though since his puppyhood that had been his home and abiding-place, and he had known and desired to know no other. It is a joke between the officer and the cheesemonger, and the former enters the shop and loudly demands to know if 'that Dog lives here.' I have not as yet had the pleasure of witnessing it, but the cheesemonger informs me that it is 'as good as a play' to observe the reassuring blink of his only eye which, at this juncture, Tinker bestows on the policeman, immediately afterwards curling himself round for a doze, as though to say, 'Let this convince you.' Tinker's stay, however, is not protracted. As soon as, according to his calculation, the coast is clear, he is off, as unexpectedly as he came, and until he is again hard pressed by the law never thinks of crossing the cheesemonger's threshold."

We spoke just now of Dogs being honest from pure conventionality; there is no doubt that many of them soon acquire a very acute sense of the conventional, and perform certain actions, or assume a certain behaviour, simply because they feel it to be the right and proper thing. We have heard of a Bull-terrier who acquired perfectly that sense of decorum which in many human beings serves in lieu of religious feeling. When this Dog was bought, it was debated whether or not it would be advisable to let him remain in the room at prayers; the question was eventually decided in the affirmative, and the Dog almost immediately seemed to get a sense of what was meant, and to feel that he was expected to behave with propriety. He therefore adopted a particular mode of procedure—a sort of canine ritual—to which he always steadily adhered. While the Bible was being read, he sat straight up on his haunches on the hearth-rug, looking solemnly into the fire. This he continued until the family knelt to pray, when he immediately went off to a corner of the room, and stood there with lowered head until all was over. He did this with such perfect solemnity that the effect was indescribably ludicrous, and friends stopping in the house had to be warned of what to expect.

The tales of canine magnanimity are endless. Every one knows that of the big Newfoundland who, being long plagued by a number of little yelping curs, one of whom at last bit him, revenged himself only by dipping the offender in the quay hard by, and, after he was cowed, plunging in and bringing him safe to land. But all Dogs are not magnanimous. Some of them, like certain men one meets with, have quite a talent for taking offence, and will pick a quarrel on the slightest provocation, or, indeed, on no provocation at all. There are, of course, the wretched little curs one meets in the street, whose sole delight seems to be to rush out suddenly and bark furiously at every passer-by; but these miserable beings act as they do rather from lack of brain, and for want of something to do, than from real badness of heart. There are Dogs, however, who are naturally quarrelsome, and will do all in their power to get up a row, simply for the pleasure of the thing. "There is a well-authenticated instance of a Terrier, who, in picking a quarrel, contrived, as if trained in the Kanzellei of Prince Bismarck, to place himself technically in the right. He would time his movements so that some passenger should stumble over him, and would then fasten on the calf of his leg. With a most statesman-like aptitude, he selected the aged, the infirm, and the ill-dressed, as the objects of his cunningly-planned attacks."†

* From the *Globe* newspaper.

† "Animal Depravity," *Quarterly Journal of Science*, 1875.

Not only are instances of quarrelsomeness to be found in Dogs, but also of the strongest desire to revenge real or supposed injuries, of the exercise of a wonderful amount of cunning and reasoning power to bring a hated rival to justice. The following anecdote forms a capital antithesis to that of Mr. Romanes' Terrier, who prevented the escape of the Dog he disliked and was jealous of, although such an event would have brought him the greatest possible comfort :—

"A fine Terrier, in the possession of a surgeon, about three weeks ago, exhibited its sagacity in a rather amusing manner. It came into the kitchen and began plucking the servant by the gown, and in spite of repeated rebuffs, it perseveringly continued in its purpose. The mistress of the house hearing the noise, came down to inquire the cause, when the animal treated her in a similar manner. Being struck with the concern evinced by the creature, she quietly followed it up-stairs into a bed-room, whither it led her; there it commenced barking, looking under the bed, and then up in her face. Upon examination, a Cat was discovered there quietly demolishing a beef-steak, which it had feloniously obtained. The most singular feature in the whole case is that the Cat had been introduced into the house only a short time before, and that bitter enmity prevailed between her and her canine companion."

Besides illustrating the desire for vengeance, this is as good an instance of reason as any we have given. The Dog evidently argued to himself in this wise :—"If I fly upon this wretched Cat and deprive her of her stolen goods by force, she will get nothing more than a fright, or, perhaps, a few tooth marks; but if I lodge a complaint against her before the proper tribunal, her guilt will be manifest to the whole household, and she will be got rid of, or even killed." The Dog, by the way he conceived and acted on this plan, showed himself to be nearly as clever and almost as wicked as a great many men one reads about in history.

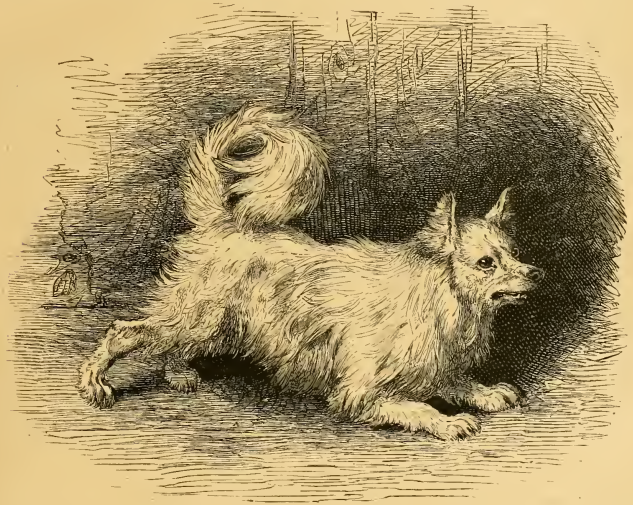
We have spoken of maternal love as exhibited by the Dog. This is, of course, a case of instinct; but instances are not wanting in which Dogs have shown the high faculty of devoted love towards other than their offspring, and of friendship like that of Ruth for Naomi. Mr. Darwin mentions a Greyhound bitch who, contrary to the usual custom of her race, fell deeply in love with a Pointer, and would have nothing to say to any other Dog during the life of her lover; and, stranger still, when he died, she showed a constancy equal to that of the best of her sex among the human race, and remained strictly faithful to his memory, never afterwards bearing pups.

Rarer than conjugal affection amongst animals, is friendship between individuals of the same sex; of this, too, instances are not wanting. Mr. Youatt relates the following :—"Two Dogs, the property of a gentleman at Shrewsbury, had been companions for many years, until one of them died of old age. The survivor immediately began to manifest an extraordinary degree of restless anxiety, searching for his old associate in all his former haunts, and refusing every kind of food. He gradually wasted away, and at the expiration of the tenth day he died, the victim of an attachment that would have done honour to man."

Of equally intense devotion to man, instances are so numerous that one hardly knows which to mention. None is, perhaps, more wonderful or more affecting than that we have already mentioned, of the Dog who watched for three months by the corpse of his dead master on Helvellyn. There is also a tale of a Newfoundland Dog, whose master—a soldier—returned to his home, after an absence of many years, when the Dog recognised him at once, "leaped upon his neck, licked his face, and died." He must have retained, during the whole of the time his master was away, the memory of his care and friendship. One cannot doubt that he often thought of and longed for him; and the rush of joy and hope fulfilled was too much for the great heart of the noble animal. He succumbed to the intensity of his feelings, thereby showing himself to be superior in one of the highest and grandest of qualities to by far the greater proportion of the human race. How many men, or even women, of one's own acquaintance, are *capable* of dying of joy!

But there is a dark side to this picture. A very large proportion of Dogs possess but little of this virtue of fidelity, but have greatly developed the contrary vice of extreme fickleness. They will change masters without the slightest objection, and be "off with the old love and on with the new" absolutely without a pang. Froissart, the chronicler, tells a curious tale respecting the treachery of Richard II.'s Dog, "a Grayhounde, called Mithe, who always wayted upon the kynge, and woulde knowe no man els. For where so ever the kynge did ryde, he that kept the Grayhounde dyd lette him lose, and he wolde streyght runne to the kynge, and faune uppon hym, and leape with his fore

fete uppon the kynge's shoulders. And as the kynge and the Erle of Derby (Bolingbroke, afterwards Henry IV.) talked togyder in the courte, the Grayhounde, who was wonte to leape uppon the kynge, left the kynge, and came to the Erle of Derby, Duke of Lancastre, and made to him the same friendly continuance and chere as he was wonte to do to the kynge. The duke, who knewe not the Grayhounde, demanded of the kynge what the Grayhounde would do? 'Cousin,' quod the kynge, 'it is a greate goode token to you, and an evyl signe to me.' 'How knowe you that?' quod the duke. 'I knowe it well,' quod the kynge. 'The Grayhounde acknowledgeth you here this day as Kynge of England, as ye shall be, and I shall be deposed; the Grayhounde hath this knowledge naturally; therefore take hym to you: he wyll follow you and forsake me.' The duke understood well these



POMERANIAN DOG.

words, and cherished the Grayhounde, who wolde never after follow Kynge Richard, but followed the Duke of Lancastre." This anecdote, curious, if true, would seem to show that rats and men are not the only animals who make haste to leave a sinking ship.

We have made mention of a certain quarrelsome Dog, fond of picking a quarrel, who always took care, with the true instinct of a cowardly bully, to pick out old or infirm persons as objects of his attacks. We are glad to say that we have found a notice of a Setter who showed a becoming respect for age. His owner says:—

"One other curious fact may here be mentioned about this Dog. Although naturally a very vivacious animal, and, when out for a walk with myself or any other young person, perpetually ranging about in search of game, yet, if taken out for a walk by an elderly person, he keeps close to heel all the time, pacing along with a slow step and sedate manner, as different as possible from that which is natural to him. This curious behaviour is quite spontaneous on his part, and appears to arise from the sense of the respect that is due to age."

We need hardly say that this Dog belongs to Mr. Romanes, amongst whose animals specimens of all the Christian gifts and graces seem to be found.

We thus see that a very large proportion of our own virtues and vices are developed in our canine "fellow-mortals"; there is, however, one state of mind which we should hardly expect to find in any animal, viz., despair. With man it is, alas! sufficiently common to feel that he has had enough of "life's fitful fever," and that the only thing left is to make haste

> "—— to be hurled
> Anywhere, anywhere, out of the world."

But who would expect a dumb quadruped to have feelings of this sort? Yet that such may be the case is rendered probable by the following remarkable story:—

"A day or two since, a fine Dog, belonging to Mr. George Hone, of Frindsbury, near Rochester, committed a deliberate act of suicide by drowning in the Medway at Upnor, Chatham. The Dog had been suspected of having given indications of approaching hydrophobia, and was accordingly shunned, and kept as much as possible from the house. This treatment appeared to cause him much annoyance, and for some days he was observed to be moody and morose. On Thursday morning he proceeded to an intimate acquaintance of his master's at Upnor, on reaching the residence of whom he set up a piteous cry on finding that he could not obtain admittance. After waiting at the house some little time, he was seen to go towards the river close by, when he deliberately walked down the bank, and, after turning round and giving a kind of farewell howl, walked into the stream, where he kept his head under water, and in a minute or two rolled over dead. This extraordinary act of suicide was witnessed by several persons. The manner of his death proved pretty clearly that the animal was not suffering from hydrophobia." *

The last statement of the writer of this anecdote may be called in question, as it is a well established fact that a mad Dog will often plunge its head into water, and make violent though ineffectual efforts to drink; and it is very likely that the Dog in question had no real intention of committing suicide, but was drowned while attempting to slake his insatiable thirst. This seems a probable explanation, though it takes the point from our tale.

Of that most horrible and fatal disease—rabies—little need be said here. It is accompanied in the Dog by inflammation, inability to swallow, insensibility to pain, even to severe blows or burns, and usually great ferocity, and a disposition to bite everything that comes in its way. The gait, the glance, and also the howl of a mad Dog are very characteristic. But the most terrible thing about rabies is that it can be communicated to man, producing in him the special human form of the disease, hydrophobia. This latter, like rabies, never arises except by inoculation with the saliva of a rabid Dog, so that both these terrible, and it is to be feared increasing diseases, might be stamped out by the adoption for a few months of a rigorous quarantine.† When a human being is bitten, symptoms of rabies usually occur in from a fortnight to three months; but a case is on record in which the disease did not appear for twelve years! When the poison is once established in the system a cure seems to be utterly impossible. The only remedy is at once either to cut out the wound or to rub it deeply and thoroughly with lunar caustic (nitrate of silver), which Mr. Youatt states to be far more efficacious than actual cauterising or burning with a red-hot iron.

The varieties or breeds of the Dog are extremely numerous, and differ from each other to a wonderful degree. In the matter of size, we have the Mastiff, as large as a pony, at one end of the series, and the Toy-terrier, a few inches long, at the other. As to the development of hair, there is every gradation, from the hairless Turkish Dog to the Skye-terrier or the Poodle; as to running powers, there are the Greyhound and the Turnspit; in the matter of mental and moral characteristics, we have the intelligent Shepherd's Dog, the obstinate and courageous Bull-dog, the silly Italian Greyhound, and the lazy Lap-dog. Never was animal so thoroughly, so unanimously, and so successfully selected: never did any show such endless variation in so many particulars.

* Quoted from the *Daily News* in the article on "Animal Depravity" in the *Quarterly Journal of Science* for 1875.

† See Sir Thomas Watson: "Hydrophobia and Rabies," *Nineteenth Century*, December, 1877.

CHAPTER VIII.

THE DOG FAMILY.—DOGS OF SAVAGES—DOGS OF CIVILISED NATIONS—WILD DOGS.

THE HARE INDIAN DOG—Its Characters, Disposition, &c.—THE ESKIMO DOG—The Dependence of the Greenlanders on its Existence—The Probability of its Speedy Extinction—Its Characters and Savage Disposition—Its Uses—DOMESTIC DOGS OF OTHER SAVAGE TRIBES—African Breeds—South American Breeds—THE DALMATIAN DOG—THE GREYHOUND—THE SCOTCH GREYHOUND—THE DEERHOUND—THE TURKISH GREYHOUND—THE GRECIAN GREYHOUND—THE PERSIAN GREYHOUND—THE ITALIAN GREYHOUND—THE COCKER—THE SPRINGER—THE KING CHARLES'S SPANIEL—THE BLENHEIM SPANIEL—THE CHINESE PUG-DOG—THE WATER-SPANIEL—THE POODLE—THE MALTESE DOG—THE LION-DOG—THE TURKISH DOG—THE ST. BERNARD DOG—THE NEWFOUNDLAND DOG—THE SHEEP-DOG—THE POMERANIAN DOG—THE CUR—THE LURCHER—THE BEAGLE—THE HARRIER—THE FOXHOUND—THE STAGHOUND—THE BLOODHOUND—THE SETTER—THE POINTER—THE RETRIEVER—THE OTTER-HOUND—THE TURNSPIT—THE DACHSHOUND—THE BULL-DOG—THE BULL-TERRIER—THE MASTIFF—THE CUBAN MASTIFF—THE TIBET DOG—THE ENGLISH TERRIER—THE SCOTCH TERRIER—PARIAH DOGS—THE INDIAN WILD DOG—THE DINGO.

NOT only has civilised man his endless breeds of Dogs, but nearly every savage tribe of any degree of intelligence has, to a greater or less degree, succeeded in producing a race exhibiting well-marked characters, useful to them as a guardian of flocks or a beast of burden. Then, in many parts of the world there are to be found troops of Dogs which have become wild, though not sufficiently so to be actually dangerous, and which act as scavengers in those countries which, like Turkey, are not blessed with a particularly stringent code of sanitary regulations. We shall first consider the Dogs kept by savages.

THE HARE INDIAN DOG.

This interesting variety (see figure on p. 104) is found only in North America, in the region of the Great Bear Lake and the Mackenzie River, where it is kept as a Hunting-dog by the Hare Indians and one or two other tribes. As we mentioned above, it deserves great interest from the fact that it closely resembles the Prairie-wolf, from which it is very probably descended.

"The Hare Indian Dog has a mild countenance, with, at times, an expression of demureness. It has a small head, slender muzzle, erect thickish ears, somewhat oblique eyes, rather slender legs, and a broad, hairy foot, with a bushy tail, which it usually carries curled over its right hip. It is covered with long hair, particularly about the shoulders; and at the roots of the hair, both on the body and tail, there is a thick wool. The hair on the top of the head is long, and on the posterior part of the cheek it is not only long, but being also directed backwards, it gives the animal, when the fur is in prime order, the appearance of having a ruff round the neck. Its face, muzzle, belly, and legs are of a pure white colour, and there is a white central line passing over the crown of the head and the occiput. The anterior surface of the ear is white, the posterior yellowish-grey, or fawn-colour. The end of the nose, the eyelashes, the roof of the mouth, and part of the gums, are black. There is a dark patch over the eye. On the back and sides there are larger patches of dark blackish-grey, or lead-colour, mixed with fawn-colour and white, not definite in form, but running into each other. The tail is bushy, white beneath and at the tip. The feet are covered with hairs, which almost conceal the claws. Some long hairs between the toes project over the soles; but there are naked callous protuberances at the root of the toes and on the soles, even in the winter time, as in all the Wolves described in the preceding pages. The American Foxes, on the contrary, have the whole of their soles densely covered with hair in the winter. Its ears are proportionably nearer each other than those of the Eskimo Dog.

"The Hare Indian Dog is very playful, has an affectionate disposition, and is soon gained by kindness. It is not, however, very docile, and dislikes confinement of every kind. It is very fond of being caressed, rubs its back against the hand like a Cat, and soon makes an acquaintance with a stranger. Like a wild animal, it is very mindful of an injury, nor does it, like a Spaniel, crouch under the lash; but if it is conscious of having deserved punishment, it will hover round the tent of its master the whole day, without coming within his reach even when he calls it. Its howl, when hurt or afraid, is that of the Wolf; but when it sees any unusual object, it makes a singular attempt at barking, commencing by a kind of growl, which is not, however, unpleasant, and ending in a prolonged howl. Its voice is very much like that of the Prairie-wolf. The larger Dogs, which we had for draught at Fort Franklin, and which were of the mongrel breed in common use at the fur-posts, used to pursue

the Hare Indian Dogs for the purpose of devouring them; but the latter far outstripped them in speed, and easily made their escape. A young puppy, which I purchased from the Hare Indians, became greatly attached to me, and when about seven months old ran on the snow by the side of my sledge for nine hundred miles without suffering from fatigue. During this march, it frequently, of its own accord, carried a small twig, or one of my mittens, for a mile or two; but, although very gentle in its manners, it showed little aptitude in learning any of the arts which the Newfoundland Dogs so speedily acquire, of fetching and carrying when ordered. This Dog was killed and eaten by an Indian on the Saskatchewan, who pretended that he mistook it for a Fox." *

THE ESKIMO DOG.

The importance of this half-tamed variety (see figure on p. 105) to the cold stunted beings who keep it can hardly be over-estimated. An undoubted authority, Dr. Robert Brown, F.L.S., observes:—

"When the Greenland Dogs die off, the Greenlander must become extinct: more certainly even than must the 'Plain' Indian when the last Buffalo is shot. It is impossible for him to drag home the Seals, Sharks, White Whales, or Narwhals which he may have shot in the winter at the 'strom-holes' in the ice without his Dogs; or for the wild native in the far North to make his long migrations, with his family and household goods, from one hunting-ground to another without these domestic animals of his. Yet that sad event seems to be not far distant. Several years ago, a curious disease, the nature of which has puzzled veterinarians, appeared among the Arctic Dogs, from high up in Smith's Sound down the whole coast of Greenland to Jakobshavn (69° 13′ N. lat.), where the ice-fjord stops it from going farther south; and the Government uses every endeavour to stop its spread beyond that barrier by preventing the native Dogs north and south from commingling. Kane and Hayes lost most of their Dogs through this disease; and at every settlement in Danish Greenland the natives are impoverished through the death of their teams. It is noticed that whenever a native loses his Dogs he goes very rapidly down-hill in the sliding scale of Arctic respectability, becoming a sort of hanger-on of the fortunate possessor of a sledge-team.

"During the latter portion of our stay in Jakobshavn, scarcely a day elapsed during which some of the Dogs were not ordered to be killed, on account of their having caught this fatal epidemic.

"The Dog is seized with madness, bites at all other Dogs, and even at human beings. It is soon unable to swallow its food, and constipation ensues. It howls loudly during the continuance of the disease, but generally dies in the course of a day, with its teeth firmly transfixing its tongue. It has thus something of the nature of hydrophobia, but differs from that disease in not being communicable by bite, though otherwise contagious among Dogs. The Government sent out a veterinary surgeon to investigate the nature of the distemper; but he failed to suggest any remedy, and it is now being 'stamped out' by killing the Dogs whenever seized—a heroic mode of treatment, which will only be successful when the last Dog becomes extinct in Greenland."

The Eskimo Dog is found throughout a great part of the Arctic regions—the herds found in Siberia, Kamtschatka, and Arctic America being all closely allied to one another, and all resembling, to a wonderful degree, the great Arctic Wolf, from which there can be little doubt they are descended. In form they resemble the Shepherd's Dog, and attain to the size of the Newfoundland. The muzzle and ears are pointed, the hair long, and with a short yellowish-grey fur between the hairs. The eyes are often oblique, and the howl peculiarly wolfish. The colour varies a good deal: some of the Dogs being black, with a white breast; others white; others reddish, yellowish, or spotted. This variety in colour is very characteristic of domesticated races of animals. There is never the same amount of difference found between the individuals of a wild species.

Not only does the Eskimo Dog agree with the Wolf in appearance, but also in disposition: it is wild, savage, and obstinate to a degree almost inconceivable to us, who are only acquainted with civilised Dogs. In illustration of the wolf-like disposition of the beast, Dr. Robert Brown relates an incident which shows that it is but little removed from its probable ancestor. We said above that it was only half-tamed; so certainly is this the case, that it "can only be kept in subjection by the most unmerciful lashing, for its savage nature will out. When at Clyde River, in 1861, I heard of a most

* Sir J. Richardson's "*Fauna Boreali-Americana*."

horrible tragedy which had been enacted there a few years before. A man, a boy, and a little girl landed there from an *omiak* (or open skin-boat), on an island where, as is usual, some Dogs were confined. Before the poor people could escape to their boat, the animals, infuriated by hunger, sprang upon them. The man and the boy, though much lacerated, managed to regain the *omiak*, but the poor girl was torn to pieces."

Wolves could hardly be much worse than this. These Dogs were, however, confined and half starved; but another writer * relates how he very nearly fell a victim to a pack of Dogs in actual use, at the door of his own hut.

"Leaving the hunters to look after their teams, I returned to the hut. The blinding snow, which battered my face, made me insensible to everything except the idea of getting out of it; and, thinking of no danger, I was in the act of stooping to enter the doorway, when a sudden noise behind me caused me to look around, and there, close at my heels, was the whole pack of thirteen hungry Dogs, snarling, snapping, and showing their sharp teeth like a drove of ravenous Wolves. It was fortunate that I had not got down upon my knees, or they would have been upon my back. In fact, so impetuous was their attack, that one of them had already sprung when I faced round. I caught him on my arm, and kicked him down the hill. The others were for the moment intimidated by the suddenness of my movement, and at seeing the summary manner in which their leader had been dealt with; and they were in the act of sneaking away, when they perceived I was powerless to do them any harm, having nothing in my hand. Again they assumed the offensive; they were all around me; an instant more and I should be torn to pieces. I had faced death in several shapes before, but never had I felt as then; my blood fairly curdled in my veins. Death down the red throats of a pack of wolfish Dogs had something about it peculiarly unpleasant. Conscious of my weakness, they were preparing for a spring; I had not even time to halloo for help—to run would be the readiest means of bringing the wretches upon me. My eye swept round the group, and caught sight of something lying half-buried in the snow about ten feet distant. Quick as a flash I sprang, as I never sprang before or since, over the back of a huge fellow who stood before me, and the next instant I was whirling about me the lash of a long whip, cutting to right and left. The Dogs retreated before my blows and the fury of my onset, and then suddenly skulked behind the rocks. The whip had clearly saved my life; there was nothing else within my reach, and it had been dropped there quite accidentally by Katutunah as he went down to the sledges."

The horrible savagery of these poor wretches can hardly be wondered at; they live in a country where there is hardly a chance for them in any independent foraging expedition; they are half-starved by their masters, being fed chiefly on frozen walrus hides in the winter, and allowed to shift for themselves in the summer when their services are not required, and are in so perennial and acute a state of hunger that they are ready at any time to eat their own harness if allowed to do so.

It is generally stated that they are perfectly insensible to kindness, and only to be kept in order by a liberal application of the lash, or even of a more formidable weapon: for the Eskimo, if their Dogs are refractory, do not scruple to beat them about the head with a hammer, or anything else of sufficient hardness which happens to be at hand. They will even beat the poor brutes in this horrible manner until they are actually stunned. Notwithstanding the absolute dependence of the Eskimo on their Dogs, little or no care is taken of them; they receive nothing in any degree approaching petting, and spend all their time in the open air.

The chief use of the Eskimo Dog is to draw the sledges, which are the only possible conveyance in that frozen land. In all the Arctic expeditions which have been sent out at various times, a good supply of Sledge-dogs has been one of the greatest *desiderata*, as without them it would be absolutely impossible to proceed far. No other animal would answer the purpose, both horses and cattle being quite useless in journeys over ice and snow, amongst which the pack of light, active Dogs make their way with wonderful ease and safety.

The presence of a good leader to every sledge-team is of the first importance: the other Dogs obey him far more implicitly than the driver, as he has gained his proud position *ri et armis*, and keeps all his subordinates in the strictest order. Notwithstanding this, the behaviour of the team while

* Hayes, quoted by Jesse.

running is far from exemplary. Captain Lyon says "they are constantly fighting, and I do not recollect to have seen one receive a flogging without instantly wreaking his passion on the ears of his neighbour." So that it is always best to trust to a good leader than to any amount of whipping, as the latter may only involve the whole concern—team, sledge, driver, and all—in hopeless and inextricable confusion. "Among the Eskimo on the western shores of Davis Straits, a loose Dog usually precedes the sledge, and, by carefully avoiding broken places in the ice, acts as a guide to the sledge-team, which carefully follows his lead."

Besides their use as draught animals, these Dogs are employed in Bear and Seal hunting. Their skin is also valuable, and the natives are extremely fond of their flesh, although, as the Dog is getting gradually scarcer, they can seldom indulge in the dainty.

THE DOMESTIC DOGS OF OTHER SAVAGE TRIBES.

The Antarctic savages occasionally domesticate the Dingo. Of this Dog we shall give an account later on. Many of the African savages—such, for instance, as the Damaras, Namaquas, and Kaffirs—also keep Dogs. The first-named of these tribes take great care of the Dogs, and value them highly. Mr. Andersson says he has "known them pay as much as two fine Oxen for a Dog." The Kaffir Dogs, on the contrary, are thought very little of. Mr. Baldwin speaks of them as "a set of noisy curs, which invariably, at the sight of a white man, tumble head-over-heels in all directions, upsetting everything, as frightened as if they had seen an apparition. After the first alarm, they bait you unmercifully, and for many minutes it is impossible to hear yourself speak. I don't know that I ever succeeded in making friends with a real Kaffir cur in my life, not even a puppy; and I scarcely ever saw, or knew, or heard of one good for anything; they do, indeed, lead the life of a Dog. They are well fed when quite young, but afterwards they are expected to provide for themselves, and are consequently wretchedly lean and mangy, but they continue to exist."

Dogs are also half-tamed by the natives of South America, where there are, according to Humboldt, two very distinct breeds, one "totally hairless—with the exception of a small tuft of white hair on the forehead and at the tip of the tail—of a slate-grey colour, and without voice. This variety was found by Columbus in the Antilles, by Cortes in Mexico, and by Pizarro in Peru (where it suffers from the cold of the Cordilleras); and it is still very frequently met with in the warmer districts of Peru, under the name of *Peiros Chinos*."

The second kind, sometimes called *Canis ingæ*, "belongs to the barking species, and has a pointed nose and pointed ears. It is now used for watching sheep and cattle. It exhibits many varieties of colour, induced by being crossed with European breeds. The *Canis ingæ* follows man up the heights of the Cordilleras. In the old Peruvian graves, the skeleton of this Dog is sometimes found resting at the feet of the human mummy, presenting an emblem of fidelity frequently employed by the mediæval sculptors."

This breed is also distinguished by great ferocity, and will bite strangers upon the slightest provocation, or even without any provocation at all. With their masters, too, they are often very surly.

We now come to

THE DOGS OF CIVILISED NATIONS,

and we commence with the Greyhound and its near allies—Dogs of swift flight, poor sense of smell, and of a comparatively low order of intelligence, the brain-case being proportionally smaller than in any other breed.

THE DALMATIAN DOG.

This is a comparatively unimportant breed; it is employed in England solely for the purpose of attending on carriages, from which circumstance it is often called the Carriage-dog. It is about the size of a Greyhound, usually of a white colour spotted with black, and its hair is quite short. The Danish Dog is a large sub-variety of the same breed.

THE GREYHOUND.

The various breeds of this Dog (see figure on p. 117) are the most elegant in the whole species. The expression "a line of beauty is perpetual motion," hackneyed though it be, occurs to every one in

thinking of a Greyhound, the shape and movements of which are so perfectly graceful. The general characters of the variety are well known, and are well and pithily given in an old rhyme, quoted by Mr. Youatt, according to which

"A Greyhounde should be headed lyke a Snake,
And neckyd lyke a Drake,
Fotyd like a Cat,
Tayled like a Ratte,
Syded like a Teme,
And chyned like a Bream."

The head is proportionally smaller than in any other variety, and, in consequence of this, the Greyhound is by no means one of the Dogs particularly noted for intellect, his energy having all gone off in the direction of speed, and there being, in consequence, none to spare for brain-power. He is, in fact, an athlete, and nothing more—a pace *et præterea nihil*. In former times the Greyhound was sufficiently strong to cope with the Wolf, but for many hundred years he has gradually degenerated in strength, and towards the close of the last century was so deficient in courage and perseverance that Lord Oxford, one of the lights of the sporting world at that time, hit upon the ingenious plan of crossing his Greyhounds with Bull-dogs. This expedient was so successful that, "after the sixth or seventh generation, there was not a vestige left of the form of the Bull-dog; but his courage and his indomitable perseverance remained, and, having once started after his game, he did not relinquish chase until he fell exhausted, or perhaps died. This cross is now almost universally adopted. It is one of the secrets in the breeding of the Greyhound."

The form of the Greyhound is as well known as that of any Dog: its long, slender muzzle, capacious chest, slender loins, and beautifully-shaped limbs, are familiar to every one; the latter form a set of spring-levers only equalled by the limbs of a Racehorse or a Deer. The colour is very variable —black, white, fawn, or brindled. The hair is short and fine, and the ears rise erect for a certain height and then hang over.

This Dog is now used only for coursing or hare-hunting. In performing this task, it is guided entirely by the eye, its sense of smell being deficient, and practically of no importance in the chase: so that if once the Greyhound loses sight of the game, the latter is started again by a Spaniel. The speed attained by a good Greyhound is very remarkable: it is, indeed, only just inferior to that of a Racehorse.

THE SCOTCH GREYHOUND.

This is a more strongly-built variety or sub-breed of the Common or English Greyhound. It is less swift than its southern brother, but more muscular, more hairy, and inclined to "dodge" the Hare in coursing, instead of winning by speed alone.

THE DEERHOUND.

This is a well-marked variety of the Greyhound breed, distinguished by stronger form, shaggy hair, and drooping ears. Both in appearance and in disposition it is wilder and more savage than the Greyhound; sometimes being decidedly inclined to ferocity. It was a Dog of this breed, named "Maida," which was the special favourite of Sir Walter Scott, and which is so often painted by the side of the great novelist, who describes his noble hound, under the name of "Bevis," in "Woodstock," as being "in strength a Mastiff, in form and almost in fleetness a Greyhound. Bevis was the noblest of the kind which ever pulled down a Stag, tawny-coloured like a Lion, with a black muzzle and black feet, just edged with a line of white round the toes. He was as tractable as he was strong and bold."

THE TURKISH GREYHOUND,

if Greyhound it should be called, is a small Dog, either entirely devoid of hair, or having only a few hairs on its tail. "He is never now in the field, and bred only as a spoiled pet—and yet not always spoiled, for anecdotes are related of his inviolable attachment to his owner. One of them belonged to a Turkish Pacha, who was destroyed by the bowstring. He would not forsake the corpse, but laid himself down by the body of his murdered master, and presently expired."*

* Youatt.

THE GRECIAN GREYHOUND

is doubtless the lineal descendant of the one sculptured on Grecian temples. It is a decidedly less specialised Dog than the English breed, its head being larger, its snout shorter, and its fur longer, especially on the tail.

THE PERSIAN GREYHOUND.

This Dog is slenderer, and has more hairy ears than the English breed. It is "much prized by the Bedouin Sheikhs, and used for the chase of the Gazelle. With its elegant shape, and the long silky hairs of its ears and tail, it is, perhaps, the most beautiful race of its kind."*

THE ITALIAN GREYHOUND

is the smallest variety of the breed, and is used almost exclusively as a pet, for which it is valuable on account of its exquisitely beautiful form and its general amiability (see figure on p. 116); but, like many amiable people, it is a thoroughly silly little beast, devoid of all higher canine intelligence, and almost incapable of forming a strong attachment.

In all the Dogs we have yet considered, the brain-case is small, and, in consequence, the intelligence is not of a very high order. In those of which we must now treat, the brain-case, with its contained organ, is of considerable size, giving the Dog the appearance of possessing a large forehead. They all, too, have great power of scent. There are, first of all, a number of Dogs consecutively grouped together under the general term of "Spaniels."

THE COCKER,

like other Spaniels, has long hair, very long pendent ears, and an elevated tail. It is one of the smallest of its kind, and is chiefly used for flushing Woodcocks and Pheasants in thickets and copses, into which the Setter, and even the Springer, can scarcely enter.

THE SPRINGER

is used for the same purpose as the Cocker, but is a larger, stronger, and steadier Dog.

THE KING CHARLES'S SPANIEL

has all the Spaniel characteristics in an exaggerated form. Its forehead is round and prominent, its coat is long and fine, the silky hair of its pendulous ears sweeps the ground, and its eye is large and moist. It is very small, and is consequently known almost entirely as a drawing-room pet. The King Charles of the present day is an interesting example of deterioration; for, as Mr. Youatt says, "it is materially altered for the worse." The muzzle is almost as short, and the forehead as ugly and prominent, as in the veriest Bull-dog. The eye is increased to double its former size, and has an expression of stupidity, with which the character of the Dog too accurately corresponds. Still, there is the long ear, and the silky coat, and the beautiful colour of the hair, for which characters the breed is still much prized. The Spaniels which were the special pets of the heartless voluptuary after whom they are named were of the black-and-tan kind. Charles I. preferred a black breed.

THE BLENHEIM SPANIEL

is very similar to the King Charles; and, like it, is almost exclusively a drawing-room pet.

THE CHINESE PUG-DOG

is an interesting variety, which has been produced by those indefatigable people, who love anything queer, and seem to think nothing perfect until it is deformed. Dr. John Edward Grey says of this Dog:—

"It is a small, long-haired Spaniel, with slender legs, and rather bushy tail curled over its back. It differs from the Pug-nosed Spaniel, called King Charles's Spaniel, in the hair being much longer and more bushy, the tail closely curled up, and the legs being smaller and much more slender. The nose of the Chinese or Japanese Pug is said by some to be artificially produced by force, suddenly

* Tristram.

KING CHARLES'S SPANIELS. *(After Sir Edwin Landseer.)*

or continuously applied; but that is certainly not the case in the skull that is in the British Museum, for the bones of the upper jaw and the nose are quite regular and similar on the two sides, showing no forced distortion of any kind such as is to be observed in the skulls of some Bull-dogs; for I believe that some 'fanciers' are not satisfied with the peculiarity, and do sometimes try to increase the deformity by force."

Dr. Lockhart states that "there are two kinds of Pug in China: one, a small black-and-white, long-legged, pug-nosed, prominent-eyed Dog; the other, long-backed, short-legged, long-haired, tawny-coloured, with pug-nose and prominent eyes. Sometimes in these Dogs the eyes are so prominent that I have known a Dog have one of his eyes snapped off by another Dog in play. The preference for vegetable food is a fact, but I think it is a result of education, as most of them will take animal food; this is usually kept from them, so that their growth and organisation may be kept down. The Sleeve

POODLES. (*One-eighth Natural Size.*)

Dog is a degenerated, long-legged variety of Pug, rigidly kept on low diet, and never allowed to run about on the ground. They are kept very much on the top of a kang, or stove bed-place, and not allowed to run about on the ground, as it is supposed that if they run on the ground they will derive strength from the ground, and be able to grow large. Their food is much restricted, and consists chiefly of boiled rice."

THE WATER-SPANIEL

is larger than any of the Spaniels already mentioned: it is also a stronger Dog, and has closely-curled hair, and ears proportionally much shorter than in the preceding breeds. It is used in shooting, having first to find the game, and then, when a bird falls, to bring it to its master without mangling. It is one of the most docile and intelligent of Dogs, and has numerous tales told of it, both in prose and poetry. Among the latter we may mention Cowper's well-known piece "The Water Lily."

THE POODLE

is a Dog of Continental origin, and is well known by its thick, generally white, curly hair, which conceals its face and covers its body like a mat. In France, and sometimes, alas! in England, people

ST. BERNARD DOGS.

try to improve the breed by shaving off the hair from the hinder half of the body, with the exception of the tip of the tail, thus making the wretched animal a spectacle to men and angels. Some misguided people go even further than this, and dye the hair of various colours—making, perhaps, a magenta body and a yellow tail, or some other equally tasteful and appropriate combination.

The Poodle, notwithstanding the way it is treated, is an extremely intelligent Dog, and capable of learning all sorts of tricks; it will walk on its hind legs, dance, sham dead, and, in fact, do almost anything it is taught. It is also affectionate and devoted, and has shown itself capable of retaining for life the memory of a deceased master.

A small variety of the Poodle is the *Barbet*, which, according to Mr. Youatt, is unmanageable except by its owner, ill-tempered, "eaten up with red mange, and frequently a nuisance to its master and a torment to every one else." Notwithstanding this, it is an extremely intelligent Dog; and, indeed, "the Barbet possesses more sagacity than most other Dogs, but it is sagacity of a particular kind, and frequently connected with various amusing tricks. Mr. Jesse, in his 'Gleanings in Natural History,' gives a singular illustration of this. A friend of his had a Barbet that was not always under proper command. That he might keep him in better order, he purchased a small whip, with which he corrected him once or twice during a walk. On his return the whip was put on a table in the hall, but on the next morning it was missing. It was soon afterwards found concealed in an out-building, and again made use of in correcting the Dog. Once more it would have been lost, but, on watching the Dog, who was suspected of having stolen it, he was seen to take it from the hall-table in order to hide it once more." *

THE MALTESE DOG

is an animal of the Poodle kind, of very considerable antiquity, as it is mentioned by Strabo as *Canis melitæus*. It has a long body, short legs, pendent ears, and long silky hair, of a pure white, or sometimes yellowish colour. One of the chief points about this Dog is its extremely small size.

THE LION DOG

is possibly, according to Mr. Youatt, a cross between the Maltese and the hairless Turkish Dog. Its name is derived from the fact that its hair, long on the head, neck, and fore-legs, is extremely short over the rest of the body, except at the end of the tail, where there is a small tuft.

THE TURKISH DOG

is occasionally seen in England, but is, properly speaking, a native of hot climates. Its usual name of Turkish or Egyptian Dog is, however, quite a misnomer. It is almost entirely naked, and, more curious still, subject to a disease of the teeth, which drop out so early that the Dogs often have nothing left to bite with but a single grinder on each side. This Dog is a curious and interesting instance of degeneration, for its two distinguishing characters—hairlessness and toothlessness—are actual deformities.

THE ST. BERNARD DOG.

This magnificent breed is now better known than formerly in England, as it is becoming quite usual to keep them instead of Mastiffs or Newfoundlands. The readers of *Punch* have been familiarised with its form, from Mr. Du Maurier's sketches, who has been as successful in depicting the noble Dog as the delightful little girl who, wishing to enter a bazaar where Dogs are not admitted, proposes to her sister to hide the gigantic creature under their skirts!

The breed was, until lately, almost confined to the Alps, where it was kept by the monks of the convent of Mount St. Bernard, and sent out, provided with a little barrel of brandy tied round its neck, to rescue travellers lost in the snow. The number of people who have been saved from death in this way, by the humanity of these good monks and the intelligence of their Dogs, must be very great, for a single Dog, the celebrated "Barry," saved no less than forty lives himself, and at last perished on one of his expeditions of mercy.

* Youatt.

is, according to Youatt, simply a large Spaniel: it is the finest and largest of Water-dogs (see figure on p. 121), besides being amongst the most intelligent and courageous. It is covered with thick curly hair, usually black or black-and-white, the curls being more flowing and not so close and woolly as in the ordinary Spaniel or the Retriever. So fully is this Dog adapted for swimming, that its feet have very considerable webs, extending between the toes—an evident adaptation to its aquatic habits.

Of the use and intelligence of this Dog it is needless to give instances. Again and again it has

FOXHOUNDS.

saved the lives of drowning people when human help was unavailable. We can give only one anecdote illustrative of the value of this Dog, whose kindness of heart is equal to his courage; who will guard and play with a little child or save a strong man from drowning with equal skill and readiness:—

"A native of Germany was travelling one evening on foot through Holland, accompanied by a large Dog. Walking on a high bank, which formed one side of a dyke, his foot slipped, and he was precipitated into the water; and, being unable to swim, soon became senseless. When he recovered his recollection, he found himself in a cottage on the contrary side of the dyke, surrounded by peasants, who had been using the means for the recovery of drowned persons. The account given by one of them was that, returning home from his labour, he observed at a considerable distance a large Dog in the water, swimming and dragging, and sometimes pushing along, something that he seemed to have great difficulty in supporting, but which he at length succeeded in getting into a small creek on the opposite side. When the animal had pulled what he had hitherto supported as far out of the water as he was able, the peasant discovered that it was the body of a man, whose face and hands the Dog was

industriously licking. The peasant hastened to a bridge across the dyke, and, having obtained assistance, the body was conveyed to a neighbouring house, where proper means soon restored the

HEAD OF BLOODHOUND.

drowned man to life. Two very considerable bruises, with the marks of teeth, appeared, one on his shoulder, and the other on his poll; hence it was presumed that the faithful beast had first seized his master by the shoulder, and swum with him in this manner for some time, but that his sagacity had prompted him to quit his hold, and to shift it to the nape of the neck, by which he had been enabled

to support the head out of water; and in this way he had conveyed him nearly a quarter of a mile before he had brought him to the creek, where the banks were low and accessible."*

THE SHEEP DOG.

This is not only the most important of all our domestic breeds, but it is second to none for intelligence and devotion. It is quite a rare thing to find a Shepherd's Dog who will offer the slightest violence to the animals under its care; and it can often be trusted almost with the entire management of the flock, driving them from place to place, gathering them together to be counted, and making altogether a far more valuable assistant to the shepherd than any human being could possibly be. The Dog is wholly devoted to the work, and his obedience and skill are perfect, penning the Sheep from field after field, for his owner, who foots it slowly after him, and finds the flock ready to his hand. It used to be credibly reported to us in our boyhood, that some of these Dogs would lay themselves down by a Sheep that had got *cast* (*i.e.*, was weltering, back downwards, in the clayey furrow, and, loaded with wet and heavy wool, had lost power to rise); these Dogs, it was said, would push their arched spine against the helpless Sheep, and give them sufficient leverage to enable them to rise.

There are different kinds of Sheep Dogs found in different countries—there are, for instance, the English, the Scotch, and the French breeds. The Scotch Drover's Dog is also a well-marked sub-breed. The Scotch Shepherd's Dog, or Colley (see figure on p. 120), is now a good deal used as a pet: it is a very beautiful Dog, with a slender muzzle, small feet, long straight hair forming a sort of ruff round the neck; and, beneath this, a sort of under-coat of very soft fine hair. The origin of the Shepherd's Dog is, according to Mr. Youatt, "somewhat various; but the predominant breed is that of the intelligent and docile Spaniel."

THE POMERANIAN DOG

is a breed often seen in London streets. It is a beautiful Dog of medium size, with long, usually white, hair, straight ears, and a tufted tail. (See figure on p. 125.)

THE CUR

is a cross between the Sheep Dog and the Terrier.

THE LURCHER

was originally bred as a cross between the Sheep Dog and Greyhound, but was afterwards modified by a further cross with the Spaniel. It is used a good deal by poachers.

The next group of Dogs is conveniently known as *Hounds:* they are all used in the chase, and, being bred and selected especially for this work, are good for little else.

THE BEAGLE

is the smallest of the Hounds, usually not exceeding ten or twelve inches in height. These Dogs were formerly a good deal used in Hare-hunting, and were celebrated for their uniform size, close running, and musical voice. So small were they that they used to be carried to the field in panniers.

THE HARRIER

was also used for hunting the Hare. It is about half-way between the Beagle and the Greyhound as to size.

THE FOXHOUND

is, in England at least, the most important of the Hound group. He may, in fact, be looked upon as one of the main supporters of that peculiarly English institution, the Squirearchy: for what would become of the average country gentleman if he could not hunt through the winter six days a week, and visit his Hounds on Sunday?

The Foxhound (see figure on p. 136) "is the old English Hound, sufficiently crossed with the Greyhound to give him lightness and speed without impairing his scent." His height is about twenty-two

* Youatt.

to twenty-four inches; his fur short, ears long and drooping, and tail tolerably straight. He exhibits great variation as to hue; and an authority, cited by Youatt, "gives a curious account of the prejudices of sportsmen on the subject of colour. The white Dogs were curious hunters, and had a capital scent; the black, with some white spots, were obedient, good hunters, and with good constitutions; the grey-coloured had no very acute scent, but were obstinate and indefatigable in their quest; the yellow Dogs were impatient and obstinate, and taught with difficulty."

The statement about the particularly good scent of the white Hounds is very curious, for it is generally found that animals of light colour are inferior in sensory endowments to darker ones, owing to the absence of a peculiar black pigment from the delicate membranes to which the nerves of special sense are distributed.

The pace of the Foxhound is very rapid. One was known to run a course of four miles one furlong and one hundred and thirty-two yards in a trifle over eight minutes! Of the correctness of their scent, no one who has seen the Hounds put off and watched the unerring way they pursue the Fox, can have any doubt.

THE STAGHOUND.

This is the largest of modern English Hounds, and the one which most nearly approaches in character the old "Hound" which fell into disuse on account of its slowness, but which we often find mentioned in olden writers. Shakspere, for instance, writes of this old English or Southern Hound in "Midsummer Night's Dream":—

Hip. I was with Hercules and Cadmus once,
When in a wood of Crete they bay'd the bear
With hounds of Sparta: never did I hear
Such gallant chiding: for, besides the groves,
The skies, the fountains, every region near
Seem'd all one mutual cry: I never heard
So musical a discord, such sweet thunder.
The. My hounds are bred out of the Spartan kind,
So flew'd, so sanded; and their heads are hung
With ears that sweep away the morning dew;
Crook-knee'd and dew-lapp'd, like Thessalian bulls;
Slow in pursuit, but match'd in mouth like bells,
Each under each. A cry more tuneable
Was never holla'd to, nor cheer'd with horn,
In Crete, in Sparta, nor in Thessaly:
Judge when you hear.

Of the powers of scent possessed by the Staghound, the following is a notable example:—

"Lord Oxford reduced four Stags to so perfect a degree of submission, that, in his short excursions, he used to drive them in a phaeton made for the purpose. He was one day exercising his singular and beautiful steeds in the neighbourhood of Newmarket, when their ears were saluted with the unwelcome cry of a pack of Hounds, which, crossing the road in their rear, had caught the scent, and leaving their original object of pursuit, were now in rapid chase of the frightened Stags. In vain his grooms exerted themselves to the utmost; the terrified animals bounded away with the swiftness of lightning, and entered Newmarket at full speed. They made immediately for the Ram Inn, to which his lordship was in the habit of driving, and, having fortunately entered the yard without any accident, the stable-keepers huddled his lordship, the phaeton, and the Deer, into a large barn, just in time to save them from the Hounds, who came into the yard in full cry a few seconds afterwards."

THE BLOODHOUND.

This Dog resembles pretty closely the Deerhound, or old English Hound, but is considerably larger, with longer ears of a soft and delicate texture, and deeper "flews," or down-hanging upper lips. (See figure on p. 137.) The colour is brown, verging to reddish along the back, and to light fawn-colour below. The eyes should be surrounded with a distinct red ring, due to the exposure of the delicate membrane lining the eyelids. To judge from the animal's countenance, no one would imagine the horrid purpose for which it was originally bred, for few Dogs have a milder, more benevolent, or more intelligent visage.

In former times, these Dogs were used to track robbers and other offenders, a duty which they performed with the most unerring accuracy, never giving up the chase until they had brought their

POINTERS.

miserable quarry to bay. When engaged in this work, all their mildness disappeared, and they were transformed into perfect furies. Mr. Youatt, writing in 1845, says:—"The Thrapstone Association lately trained a Bloodhound for the detection of Sheep-stealers. In order to prove the utility of this Dog, a person whom he had not seen was ordered to run as far and as fast as his strength would

permit. An hour afterwards, the Hound was brought out. He was placed on the spot whence the man had started. He almost immediately detected the scent, and broke away, and, after a chase of an hour and a half, found him concealed in a tree fifteen miles distant!"

THE SETTER,

according to Youatt, "is evidently the large Spaniel, improved to his peculiar size and beauty, and taught another way of marking his game, viz., by *setting* or crouching. If the form of the Dog were not sufficiently satisfactory on this point, we might have recourse to history for information on it. Mr. Daniel, in his 'Rural Sports,' has preserved a document, dated in the year 1685, in which a yeoman binds himself, for the sum of ten shillings, fully and effectually to teach a Spaniel to *sit* Partridges and Pheasants. The first person, however, who systematically broke-in sitting Dogs is supposed to have been Dudley, Duke of Northumberland, in 1335." The hinder surface of the legs, and the under surface of the tail of the Setter, should be well "feathered," that is, beset with long hair.

THE POINTER.

Mr. Darwin says:—"Our Pointers are certainly descended from a Spanish breed, as even the names Don, Ponto, Carlos, &c., would show. It is said that they were not known in England before the Revolution in 1688; but the breed, since its introduction, has been much modified," the change having been "chiefly effected by crosses with the Foxhound." The value of this Dog consists in his habit of "pointing," or standing silently, with lifted foot and outstretched muzzle, as soon as he finds game. A very remarkable circumstance with regard to this habit is the way in which it is inherited: a young Dog points instinctively the first time he is taken into the field.

More or less distinct sub-breeds of the Pointer are to be found in Spain, Portugal, France, and Russia. The hair is short, the colour variable.

THE RETRIEVER,

according to Brehm, is a cross between the Newfoundland and the Pointer. It is a good water-dog, and is used for sport, especially in shooting water-birds. It derives its name from its talent for *retrieving*, or following a wounded bird, and bringing it back to the sportsman without mangling. It is a large Dog, with a good forehead and long ears, and is covered with a closely-curled hide of a brown or black colour. (See figure on p. 113.)

THE OTTER-HOUND

is a breed formerly in great requisition for hunting the Otter, a sport which is now almost if not quite discontinued. This Dog "used to be of a mingled breed, between the Southern Hound and the rough Terrier, and in size between the Harrier and the Foxhound."

THE TURNSPIT.

Before the invention of bottle-jacks, this Dog was used in England to turn the spit on which the joint was roasted, for which purpose they were attached to a sort of wheel. It is a queer-looking Dog—very long-bodied and very short-legged, and is possessed of a great degree of intelligence. Brehm relates an anecdote of two Turnspits, who were employed in the kitchen of a house at Plessis, one of whom, the cook's favourite, had to turn the spit on Mondays and Wednesdays; the other taking his turn on Sundays, Tuesdays, and Thursdays. Friday and Saturday were holidays for both. One Wednesday the favourite Dog was absent, and the cook endeavoured to press into service the other rather than search for and disturb his pet. But No. 2, although he had made no objection to having three days of work to his mate's two, could not stand this: he growled and bit, and positively refused to be harnessed. At last he rushed out of the house, and made his way to an open place, where his lazy colleague was playing with some friends. As soon as he saw the truant, he hustled and bit at him, and finally drove him into the house to the cook's feet, having accomplished which act of justice he became calm, and looked quietly up to his master, as much as to say—"Here's your Dog; it's *his* turn now."

DACHSHOUNDS, OR BADGER-DOGS.

BULL DOG.

THE DACHSHOUND, OR BADGER-DOG,

is a German breed, closely allied to the Turnspit, but with the characters of the latter exaggerated. The fore-legs are crooked at the wrist-joint, and the feet are very large. It was originally bred, as its name implies, for Badger-hunting, and, so strong is its instinct for the sport even now it has become a drawing-room pet, that it will rush at anything that looks like a hole, and begin to burrow vigorously.

THE BULL-DOG

is undoubtedly the most savage and untamable of all the breeds: he is, moreover, except to the eyes of a fancier, the ugliest; for, although he has not the grotesque proportions of the Turnspit, yet his crooked legs, Rat's tail, flat forehead, little wicked eyes, turned-up nose, big mouth, and underhung lower jaw, make him a creature absolutely hideous to any one whose taste is not sufficiently cultivated to enable him to admire anything "proper." The two features of the crooked legs and the underhung jaw are simply selected and perpetuated deformities. The projection of the lower jaw and the receding of the nose are extremely marked, and give the Dog a most sinister appearance. The chest of a good Bull-dog is very broad and strong. The hind-quarters, on the other hand, are comparatively feeble.

The Bull-dog was formerly used—as its name implies—for the barbarous "sport" of Bull-baiting, in which our forefathers took so much delight. The Dog would seize upon the Bull's nose and lip, and no power in heaven or earth could make him leave his hold. He would even fight with the Lion, and seize upon his gigantic antagonist again and again, although torn and mangled all over with great claw-wounds.

Although not a water-dog, the Bull-dog is a capital swimmer, his immense strength and indomitable pluck giving him an advantage over even such a professed swimmer as the Newfoundland. "During a heavy gale, a ship had struck on a rock near the land." The only chance of escape for the shipwrecked was to get a rope ashore; for it was impossible for any boat to live in the sea as it was then running. There were two Newfoundland Dogs and a Bull-dog on board. One of the Newfoundland Dogs was thrown overboard, with a rope thrown round him, and perished in the waves. The second shared a similar fate; but the Bull-dog fought his way through that terrible sea, and, arriving safe on shore, rope and all, became the saviour of the crew."

Little is known as to the origin of the Bull-dog, but Mr. Darwin makes the curious and interesting statement that "some authors who have written on Dogs maintain that the Greyhound and Bull-dog, though appearing so different, are really closely-allied varieties, descended from the same wild stock; hence I was anxious to see how far their puppies differed from each other. . . . On actually measuring the old Dogs and their six-day-old puppies, I found that the puppies had not acquired nearly the full amount of proportional difference."

THE BULL-TERRIER

is a cross between the Bull-dog and the Terrier, and is generally superior, both in appearance and value, to either of its progenitors. "A second cross considerably lessens the underhanging of the lower jaw, and a third entirely removes it, retaining the spirit and determination of the animal."

THE MASTIFF.

This Dog "is probably an original breed peculiar to the British Islands." It is larger than the Bull-dog, has a head of somewhat the same shape, with deep flews, but its ears are pendent, and it has none of the Bull-dog's deformity. (See figure on p. 109.) From the Bloodhound it is distinguished by the shape of the head, which is rounder and shorter, and by the absence of the red ring round the eye. At the present day, the Mastiff is used chiefly as a house Dog, for which purpose his fidelity and strength make him thoroughly well suited.

THE CUBAN MASTIFF

is about intermediate in size between the Bull-dog and the English Mastiff; in appearance it closely resembles the latter. It is an extremely savage Dog, and was used in the days of slavery for tracking runaway negroes. It is now used as a watch Dog, and, by the Spaniards, for Bull-fighting.

THE TIBET DOG.

This magnificent animal is kept by the Bhoteas, a race inhabiting the table-lands of Tibet, who use it as a watch Dog. It is about the size of a Newfoundland Dog, but with a head more like that of a Mastiff, the "flews," or pendent side-flaps of the upper lip, being of great size. The hair is long, and the tail bushy and well curled.

Mr. Bennett says of some specimens kept in the Zoological Gardens many years ago, that they

TIBET DOG.

"were larger than any English Mastiff we have seen. Their colour was a deep black, slightly clouded on the sides; their feet and a spot over each eye alone being of a full tawny or bright brown. They had the broad, short, truncated muzzle of the Mastiff, and lips still more deeply pendulous." In disposition they are—at any rate in their native country—"tremendously fierce, strong, and noisy; and while savage by nature, or soured by confinement, so impetuously fierce, that it is unsafe, unless the keepers are near, even to approach their dens."

This Dog was known to the Greeks and Romans, whose writers mention its fierce conflicts with the Aurochs, the Wild Boar, and even the Lion.

THE ENGLISH TERRIER.

This is a small Dog, with a good forehead, prominent eye, pointed muzzle, and usually short hair. The colour varies greatly—white and black-and-tan being perhaps the commonest hues; in the latter

case, there is always a tan-coloured spot on the eye, a circumstance which it is interesting to remark, as a similar spot occurs in nearly all black Dogs with tan-coloured feet.

The Terrier is used for unearthing the Fox, but his chief accomplishment is Rat-killing, in which noble sport he is a great adept. "There are some extraordinary accounts of the dexterity, as well as courage, of the Terrier in destroying Rats. The feats of a Dog called 'Billy' will be long remembered. He was matched to destroy one hundred large Rats in eight minutes and a half. The Rats were brought into the ring in bags, and as soon as the number was complete, he was put over the railing. In six minutes and thirty-five seconds they were all destroyed. In another match he destroyed the same number in six minutes and thirteen seconds. At length, when he was getting old, and had but two teeth and one eye left, a wager was laid of thirty sovereigns, by the owner of a Berkshire Bitch, that she would kill fifty Rats in less time than Billy. The old Dog killed his fifty in five minutes and six seconds. The pit was then cleared and the Bitch let in. When she had killed thirty Rats she was completely exhausted, fell into a fit, and lay barking and yelping, utterly incapable of completing her task."

THE SCOTCH TERRIER

has a large head, short stout legs, and long, rough, shaggy hair. The colours of the pure breed are black and fawn. This breed is probably of more ancient origin than the English Terrier. It is an extremely intelligent, faithful, and affectionate animal, and, like its relative from south of the Border, a great Rat-catcher. The "*Dandie Dinmont*" breed, so well known from the immortal Pepper and Mustard in "Guy Mannering," is a variety of the Scotch Terrier; so also is the *Skye Terrier*, which is distinguished by its long hair and short legs. In all these Terriers, as well as in the English breed, a black nose and black roof to the mouth are points of importance.

PARIAH DOGS.

Having considered the chief *bonâ fide* varieties of the Dog, we come, lastly, to those nondescript animals, the *Pariahs*, or domesticated Dogs run wild, which occur in packs in many parts of Eastern Europe and of Asia. These herds of miserable, half-starved animals are undoubtedly not true wild Dogs, but degenerated tame ones, the Dog being derived from a wild ancestor, under certain circumstances shows his descent by reverting to the habits of his forbears. Instances of this occur occasionally in the case of even the better breeds of Dogs. For instance: "A black Greyhound Bitch, belonging to a gentleman in Scarisbrick, in Lancashire, though she had apparently been well broken-in and always well used, ran away from the habitation of her master, and betook herself to the woods. She killed a great many Hares and made free with the Sheep, and became an intolerable nuisance to the neighbourhood. She was occasionally seen, and the depredations that were committed were brought home to her. Many were the attempts made to entrap or destroy her, but in vain; for more than six months she eluded the vigilance of her pursuers. At length she was observed to creep into a hole in an old barn. She was caught as she came out, and the barn being searched three whelps were found, which, very foolishly, were destroyed. The Bitch evinced the utmost ferocity, and, although well secured, attempted to seize every one who approached her. She was, however, dragged home, and treated with kindness. By degrees her ferocity abated. In the course of two months she became perfectly reconciled to her original abode, and a twelvemonth afterwards (1822), she ran successfully several courses. There was still a degree of wildness in her appearance; but, although at perfect liberty, she seemed to be altogether reconciled to a domestic life."

Captain Williamson says "that many persons affect to treat the idea of degeneration in quadrupeds with ridicule; but all who have been any considerable time resident in India must be satisfied that Dogs of European breed become, after every successive generation, more and more similar to the Pariah, or indigenous Dog of that country. The Hounds are the most rapid in their decline, and, except in the form of their ears, they are very much like many of the village curs. Greyhounds and Pointers also rapidly decline, although with occasional exceptions. Spaniels and Terriers deteriorate less: and Spaniels of eight or nine generations, and without a cross from Europe, are not only as good as, but far more beautiful than, their ancestors. The climate is too severe for Mastiffs, and they do not possess sufficient stamina; but, crossed by the East Indian Greyhound, they are invaluable in hunting the Hog."

The Pariah Dogs occur in Turkey, Egypt, Syria, China, India, &c., varying a good deal according to their abode. Their habits are well described by Mr. G. R. Jesse, whose account of the Egyptian Pariah will apply equally well to that of Constantinople, or of any other place where sanitary regulations are simply *nil*, and where the Dogs are the only creatures who make any attempt to clear the place of fever-breeding filth.

"The Dogs of the Egyptian towns are masterless, and live on carcases thrown out on the mounds of rubbish outside the walls and what is cast them by the charitable. In the villages, and with the shepherds along the desert, they are better cared for, protecting the property of the people from thieves, and their animals from wild beasts. These Dogs are generally sandy in colour, but they vary—some are black, and others white. At Ermeret, near Thebes, is a breed of black Dogs, quite different from those of Lower Egypt—fierce, excellent watchers, having roughish wiry hair, and drooping but small ears: they are stated to be derived from the Slowara Arabs. Numbers of Dogs congregate on some of the rubbish mounds outside the gates and walls of Cairo, and live on the carcases of Horses, Asses, &c., which are thrown there, the Arabs not having arrived at that pitch of Western economy which terminates the utility of a beast of burden at a cheap restaurant. These masterless Dogs act as scavengers, in which capacity they are accompanied by the large black-and-white yellow-billed Carrion Hawk, Kites, and troops of black-and-grey Carrion Crows. Among the skeletons, and scattered bones, heads, and hoofs, these Dogs—about two feet in height, generally of a yellow colour, or black, or a dirty white, smooth-skinned, and mostly with erect pointed ears—may be seen in crowds, their mouths and necks bloody, snarling, snapping, fighting, tearing, and gorging to repletion. The bitches scratch holes in the rubbish-heaps, and there bring forth their young. After the bones of the dead animals are cleared of flesh by the Dogs, bundles of them are collected and carried off by women and children. The Dogs of the town associate in bands, and each band has its district and its chief. No other Dog is permitted to enter the territory without being at once assailed. If, however, a Dog wishes to pass from one quarter of the town to another, he is said to creep along with his tail down in a humble manner, and immediately the Dogs of that part come upon him to throw himself on his back, and deprecate their attack. After due examination, he is allowed to proceed, but repeats his submissive actions whenever he meets new foes, and so, after enduring repeated challenges, gains his destination. These Dogs are still and quiet during the day (unless, indeed, an European comes in sight, when their vociferousness is loud and long), but at night they are very vigilant, and guard the bazaars against the nocturnal thief."

In some parts of India the superfluous Pariahs are utilised by giving them as food to caged Tigers. An anecdote is related of one who proved himself a match for the Tiger, and who was, as a reward, admitted to close intimacy with the royal beast.

"I knew an instance," says Captain Williamson, "of one that was destined for the Tiger's daily meal standing on the defensive, in a manner that completely astonished both the Tiger and the spectator. He crept into a corner, and whenever the Tiger approached, seized him by the lip or the neck, making him roar most piteously. The Tiger, however, impelled by hunger—for all supply of food was purposely withheld—would renew the attack. The result was ever the same. At length the Tiger began to treat the Dog with more deference, and not only allowed him to partake of the mess of rice and milk furnished daily for his subsistence, but even refrained from any attempt to disturb him. The two animals at length became reconciled to each other, and a strong attachment was formed between them. The Dog was then allowed ingress and egress through the aperture; and, considering the cage as his home, he left it and returned to it just as he thought proper. When the Tiger died he mourned the loss of his companion for a considerable period."

In Siam, these unhappy creatures are equally abundant, and are even worse off. Mr. Thomson* states that they occur in great numbers in nearly all the temples. "It is contrary to the Buddhist creed to take away life; hence many of their temples become places of refuge for troops of famished Dogs, who remain there till they die; for though the priests give them what food they can spare, there is never enough for them all. These Dogs, then, are usually animated skeletons, their skins destitute of hair, and covered with many sores. I tossed them a little food; it gave rise to the most

* "The Straits of Malacca, Indo-China, and China."

savage fight I ever witnessed. One or two wretched curs limped away from the strife, torn and lacerated, probably to lie down and die. This canine community—fierce, hungry, and diseased—must surely be one of those many Buddhist hells where sorcerers expiate their crimes. The animals are deemed to be animated by the spirits of the departed, and are undergoing a lifetime of torture. The priests, if they are good men, look on at their misery with pious complacency, and probably take the lesson to heart, lest they, too, in the next stage of their existence, should be condemned to howl for offal or garbage to satisfy the hungry pangs and sore-eaten frames of starving Pariah Dogs."

DINGO.

THE INDIAN WILD DOG.*

This animal, which exists in large numbers all over the peninsulas of India and Malacca, differs so much from the ordinary Dogs, that it has been proposed to separate it from them under a different generic name, *Cuon*. Its distinctive characters are, however, by no means sufficiently great to warrant this separation. It occurs, under slightly different varieties, in different parts of India, and receives various native names. By the Mahrattas it is called *Kolsun* (*Canis dukhunensis* of Colonel Sykes); *Sona kúta*, or Golden Dog, in Central India; *Buansú* in the Himalayas; *Dhole* in Ceylon, and so on.

A capital notion of the appearance of this interesting Dog may be obtained from a case of stuffed specimens now in the India Museum at South Kensington. The Zoological Society has at different

* *Canis primævus.*

times been able to exhibit in their Gardens more or less fine examples of the Indian Wild Dog. Dr. Murie gives the following account of a male and female specimen sent to the Gardens some time ago :—

"Their *tout ensemble* conveyed to me the idea of a compound between Wolf, Jackal, and Fox, partly on account of their colour, partly from their size and general shape, and also partially from the contour of the head, ear-outline, and direction of the eyes. But, on the other hand, a critical inspection left the impression that they were more markedly of the Dog type. This pair of animals very nearly corresponded in size," the most important dimensions being—length, from snout to tip of tail, forty-two inches; length of the tail, twelve inches; height at shoulder, about fifteen inches, and at the loins about sixteen inches.

"Their colour was entirely reddish or fulvous brown, and remarkably like the tint of a Fox. The tip of the nose and lower part of the face was somewhat darker; the tail also exhibited deepening of hue. Moreover, upon the outer side of the hind-leg, and similarly on the fore-limb, there was a tendency, though a very indistinct one, to whitish spotting. . . . Of those features marking race, the tail was moderately lengthened, dark, and full below, as in the Jackal or Wolf, and not with the great round brush of the Fox. The eye had a certain obliquity; but the pupil, as far as I could ascertain, was round. Ears large, erect, and hairy."

"I am not cognisant of any observations as to their habits having been noted prior to their receipt by the Society. But I may mention that when in the Gardens they were exceedingly active, snapping, snarling, and in their general behaviour resembling a couple of Wolves rather than sedate Dogs. I am not aware that they were heard to bark; but occasionally they howled and whined."

The Wild Dog has thus, in many respects, an appearance resembling that of a Fox or a Jackal, with which it also agrees in its filthy smell. It is, however, a true Dog, although less specialised than the domestic kinds, and therefore approaching the average structure of the wild *Canidæ*.

These Dogs hunt in packs, six, eight, ten, or as many as thirty, animals in a pack. They hunt either by night or day; and it is said that "when once a pack of them put up any animal, no matter whether Deer or Tiger, that animal's doom is sealed; they never leave it. They will dog their prey for days, if need be, and run it down exhausted, and if it turns to fight, they go in fearlessly, and by their numbers win. All animals dread the Wild Dog; others they may elude by speed, artifice, or battle: but their instinct tells them that there is no escaping the Wild Dog, as it hunts in packs by scent as well as by sight, and is as brave as it is persevering."

They make no noise when running, except sometimes a low whispering kind of note, which may either express their own gratification, or act as a signal to other Dogs. Great numbers of them are destroyed in their hunting expeditions, as the larger animals, such as the Elk and Boar, defend themselves with great fierceness, and sacrifice many of their pursuers before they fall a victim to the overwhelming numbers and unconquerable perseverance of the latter.

In some parts of India they are half-domesticated, and used in the noble sport of "Pig-sticking." "They are remarkably savage, and frequently will approach none but their *doonahs*, or keepers, not allowing their own masters to come near them. Some of them are very fleet, but they are not to be depended upon in coursing; for they are apt suddenly to give up the chase when it is a severe one, and, indeed, they will too often prefer a Sheep or a Goat to a Hare. In Hog-hunting they are more valuable. It seems to suit their temper, and they appear to enjoy the snapping and the snarling incident to that species of sport."*

THE DINGO, OR AUSTRALIAN WILD DOG.†

This is another distinct breed of Wild Dog, quite as remarkable in its way as the Indian Wild Dog, and possessing far greater interest than the latter, from the fact that it is the only Mammal not belonging to the group of Marsupials, or pouched animals (Kangaroos, Wombats, &c.), found in the great island of Australia. In all probability, it is not a true native even there, but was most likely introduced before the discovery of the island by Europeans.

The Dingo "approaches in appearance to the largest kind of Shepherd's Dog (see figure on

* Williamson, quoted by Youatt.

† *Canis dingo.*

page 147). The head is elongated, the forehead flat, and the ears short and erect, or with a slight direction forwards. The body is thickly covered with hair of two kinds—the one woolly and grey, the other silky and of a deep yellow or fawn colour. The limbs are muscular, and, were it not for the suspicious yet ferocious glare of the eye, he might pass for a handsome Dog. When he is running, the head is lifted more than usual in Dogs, and the tail is carried horizontally. He seldom barks." *

There are some Dingoes in the Zoological Gardens, and one would never guess their savageness of disposition from their innocent faces. They are decidedly good-looking Dogs in appearance, but as regards temper they are anything but pleasant animals, although quite tamable if taken young: they are, indeed, often domesticated by the natives, but are never known to attain to those higher qualities which make the thoroughly civilised Dog so valuable.

"When Van Diemen's Land began to be colonised by Europeans, the losses sustained by the settlers by the ravages of the Wild Dogs were almost incredible. The districts infested by these animals were principally those appropriated to Sheep, and there was scarcely a flock that did not suffer. It was in vain to double the number of shepherds, to watch by night and day, or to have fires at every quarter of the field; for these animals would accomplish their object by stratagem or force. One colony lost no fewer than 1,200 Sheep and Lambs in three months; another colony lost 700.

"The ravagers were either the native Wild Dogs of the island or those that had escaped from their owners. They seemed to have apportioned the country into different districts, each troop having its allotted range. At length the evil became so great, that a general meeting of the colonists was convened. The concluding sentences of the speech of Lieutenant Hill forcibly express the extent of the evil:—'The country is free from bushrangers: we are no longer surrounded and threatened by the natives. We have only one enemy left in the field; but that enemy strikes at the root of our welfare, and through him the stream of our prosperity is tainted at its very source.' The colonists were then few, but they cordially united in the endeavour to extirpate this formidable enemy; and, although the Wild Dog is still found in the interior of the island, he is comparatively seldom seen, and his ravages have nearly ceased." †

CHAPTER IX.

THE DOG FAMILY.—WOLVES—JACKALS—FOXES, ETC.

THE WOLF—Historical Account—Geographical Distribution—Characteristics—Habits—Destructiveness—Tame Wolves—Varieties of the Wolf—THE PRAIRIE WOLF—THE RED WOLF—THE JACKAL—Its Character—Habits "Jackal's Horn"—Occurrence—THE BLACK-BACKED JACKAL—THE SENEGAL JACKAL—THE AGUARA—THE COMMON FOX—Characters distinguishing it from the true Dogs—Its Habits—Cunning—Occurrence—THE ARCTIC FOX—Its Supposed Change of Colour according to Season—Its Habits—The Value of its Skin—THE FENNEC—THE LONG-EARED FOX—Why made a Distinct Genus—THE RACCOON DOG—THE HYÆNA DOG—Its Character and Habits.

THE WOLF.‡

We have considered all the most important "beasts of prey," with two exceptions, under the Cat family, to which they belong. Two important ravagers still remain—the Bear, of which we shall speak by-and-bye, and the Wolf, whose turn has now come. Of the great Cats, much good is often spoken. Notwithstanding their cruelty and bloodthirstiness, they are handsome, strong, and usually courageous: each one hunts his prey for himself, and when he has satisfied his appetite, leaves the remainder to inferior beasts, disdaining, unless when reduced by starvation, to touch any but fresh meat. The Bear, too, often has a word said for him: his curious, half-good-natured look, his semi-human waddle, the tricks he is capable of learning, all combine to make him seem not so very objectionable a beast after all. But who ever heard any good said of a Wolf? There have, indeed, been a few instances of Wolves in captivity who have shown much affection and fidelity to their masters; but, under ordinary circumstances, cruel, cowardly, dastardly, greedy, pitiless, are the adjectives applied to him.

The Wolf has a place in history as venerable as that of the Lion, and he was the dread of the shepherd four thousand years ago. A very old Sheep-master, addressing his sons on his death-bed

* Youatt. † Youatt. ‡ *Canis lupus.*

—these sons being, eleven out of twelve of them, shepherds—said of the youngest:—"Benjamin shall ravin as a Wolf: in the morning he shall devour the prey, and at night he shall divide the spoil."

Homer also, in his immortal "Iliad," frequently brings in the Wolf, giving with a few master-touches a vivid picture of the hated brute's habits:—

"Sudden as hungry Wolves the Kids purloin,
Or Lambs, which haply some unheeding swain
Hath left to roam at large the mountains wild;
They, seeing, snatch them from beside the dams,
And rend incontinent the feeble prey."

——"As Wolves that gorge
The prey yet panting, terrible in force,
When on the mountains wild they have devour'd
An antler'd Stag new-slain, with bloody jaws
Troop all at once to some clear fountain, there
To lap with slender tongues the brimming wave;
No fears have they, but at their ease eject
From full maws flatulent the clotted gore."

The ancient Greeks and Romans had a very curious superstition about the Wolf. They believed that if a man and a Wolf met, and the beast saw his human enemy before the latter caught sight of him, the man became dumb. Hence the Greek proverb, λύκον ἰδεῖν, "to see a Wolf," that is, to be struck dumb. Virgil expresses the same notion in his "Bucolics"—

"Nunc oblita mihi tot carmina: vox quoque Mœrim
Jam fugit ipsa: lupi Mœrim vidêre priores." *

There are many ancient proverbs of which the Wolf is the theme; one is often used now, "*lupus in fabula*," used in much the same sense as "Talk of the Devil." Then there is "*ovem lupo committere*," equivalent to our "set the Fox to watch the Geese"; "*hac urget lupus, hac canis angit*," of much the same significance as "a Donkey between two bundles of hay"; and many others.

We have said that the Wolf is everywhere detested; there is an historical exception to this. He was held in great veneration and even worshipped by the ancient Egyptians, who often embalmed his body, and one of whose cities, Lycopolis (the modern Siout), was named after him.

The Common Wolf is still very abundant in many parts of Europe, being found in Spain, Greece, Italy, France, Eastern Germany, Poland, Russia, Sweden, Norway, and Lapland. In Switzerland they are now rare, and in the remainder of the Continent extinct.

It is very curious to think that such a beast as the Wolf should now flourish in a neighbouring country like France, as we have quite forgotten the time since any plague of the sort existed in England. And yet it is barely two centuries since they were finally got rid of, and in early times they were quite common over a great part of the island, and, of course, did an immense amount of damage. One Saxon king, Edgar, "applied himself to their extirpation in earnest, enlisting English criminals in the service, by commuting the punishment awarded for their crimes to the delivery of a certain number of Wolves' tongues, and liberating the Welsh from the payment of the tax of gold and silver, on condition of an annual tribute of three hundred Wolves. But the vast wild tracks and deep forests of ancient Britain were holds too strong even for his vigorous measures. What the number and consequent danger had been may be imagined from the necessity that existed, in the previous reign of Athelstan (A.D. 925), for a refuge against their attacks. Accordingly, a retreat was built at Flixton in Lancashire, to save travellers from being devoured by these gaunt hunters. The Saxon name for the month of January, 'Wolf-moneth,' in which dreary season hunger probably made the Wolves more desperate, and the term for an outlaw, 'Wolfshead,' implying that he might be killed with as much impunity as a Wolf, also indicate the numbers of these destructive beasts, and the hatred and terror which they inspired.

* Virgil, Ec. ix., 53:—

"All, all forgotten now, those youthful lays;
My voice will follow, ay, my voice decays;
The Wolf hath eyed me first, hath Mœris eyed."

"That Edgar failed in his attempts at extirpation is manifest from a *mandamus* of Edward I., to all bailiffs, &c., to give their assistance to his faithful and beloved Peter Corbet, whom the king had enjoined to take and destroy Wolves . . . in all forests and parks and other places in the counties of Gloucester, Worcester, Hereford, and Salop, where they could be found. . . . Even so late as 1577, the flocks of Scotland appear to have suffered from the ravages of Wolves, which do not seem to have been rooted out of that portion of the kingdom till about the year 1680, when Sir Ewen Cameron's hand laid the last Wolf low. In Ireland, Wolves must have lingered as late as the year 1710; about which time the last presentment for killing them in the county of Cork was made."

The Wolf is about the size of a large Shepherd's Dog, measuring some five feet from snout to tip of tail: of this length about twenty inches are taken up by the tail. The height at the shoulders is about thirty-two inches. The skin is of a dark yellowish-grey colour, or sometimes almost black; the hair is long and coarse in the northern varieties, which have to sustain existence through a long, cold winter, and shorter in the southern kinds, which enjoy a warmer climate. There is also a good deal of variation in colour, according to the country from which the animal comes.

The muzzle has much the same shape as that of many Shepherd's Dogs, but the ears are very upright and pointed, and the eyes are set obliquely; in this respect the difference between a Wolf and a Dog is very striking—the obliquity of the eye in the former gives him a most sinister expression. The pupil of the eye is round. The bushy tail, too, is not curled up like a Dog's, but held down, almost between the hind legs. But perhaps the most striking difference from the Dog is in the voice; the Wolf never barks—that is entirely a civilised habit: even Dogs allowed to become wild lose it—but howls in a horrible and ghastly manner.

The Wolf usually lives in solitary places in mountains; but in Spain he is said sometimes to make his lair in corn-fields, in close proximity to inhabited dwellings. Here he lives with his wife and family, usually *caché* during the day, and issuing forth at night to take his prey. During the warmer periods of the year Wolves, as a rule, hunt each one for himself, but in the winter they often unite into great packs, and pursue their prey over the snow at a rapid pace and with indomitable perseverance. Swift and untiring must be the animal which, on an open plain, can escape from them; even the Horse, perfectly constructed as he is for rapid running, is almost certain to succumb, unless he can reach a village before his pace begins to flag. They never spring upon an animal from an ambush—the nearest approach ever made to such a mode of attack being their practice of attacking sheepfolds by leaping into the midst of the flock and killing right and left; when they reach their prey, too, the first onslaught is made with the teeth, and never by a blow of the paw. Thus, a Wolf's attack—like that of all members of the genus Canis—is entirely different from a Cat's. The Cat lies in ambush all alone, springs upon the passing prey, which, if he misses he scarcely ever pursues, and kills by a blow of the paw. The Dog and Wolf attack openly, sometimes alone, but oftener in company, pursue their prey with unflagging energy until it falls a victim, and give the death-wound at once with their teeth. To shepherds the Wolf is, and has been from the earliest times, a most unmitigated curse. A single Wolf will leap the wall of a sheepfold and murder perhaps a quarter or a third of the flock before his lust of slaughter is satisfied. Of course, he cannot eat more than one, or part of one, and the others he slays from wanton cruelty. Mutton is naturally his standing dish, as it can be procured, if at all, in abundance, and with comparatively little difficulty; but he is not at all particular, and will eat Deer, Goats, Birds, and even Reptiles. But his favourite meat, curious to relate, is *Dog*, and there are many instances related of the eagerness and recklessness shown by Wolves to obtain this cannibal feast. "Wolves have been known to carry off a Pointer from a sledge going at full gallop. The animal leaps with a single bound amongst the three or four persons in the vehicle, who remain stupefied at so much audacity, seizes his innocent victim, and plunges again into the forest. The whole is done in less time than it takes to tell. Another time, it is a young Newfoundland, which his master, travelling on horseback, has placed before him, on the pommel of his large saddle; the Wolf sees him, leaps upon and seizes him, and carries him off without touching man or horse."*

If the Wolf confined himself to Sheep and Dogs, matters would be bad, indeed, but still endurable; unfortunately, however, this horrible savage likes human flesh just as well as "flesh of muttons, beefs,

* L. Énault, quoted by Brehm.

or goats." A single Wolf hardly ever dares attack a man, for he is essentially a cowardly animal, but a child may be now and then carried off, and a man or a body of men may be attacked by an immense troop of Wolves, and then, unless they can get to a village or some other shelter, their fate is sealed. They may kill the Wolves by dozens, expend all their ammunition, making every shot tell, fell the howling monsters till their swords are hacked like Falstaff's, but it is all of no avail: each falling Wolf is replaced by a fresh one hungrier and more vigorous than himself, and the end, unless succour come, can only be death by the teeth and a grave in the maw of perhaps hundreds of Wolves. It is related that, in 1812, twenty-four French soldiers were attacked by Wolves, and after a hard fight, were all slain and devoured; their comrades found only the remains of their arms and uniforms, together

COMMON WOLF.

with a few bones, and the bodies of two or three hundred Wolves who had fallen in the unequal struggle, only to add to their comrades' banquet.

The destruction wrought by these animals in countries where they abound is very great. "In 1823, in Livonia, a declaration made to the authorities stated, as having been carried off by Wolves, 15,182 Sheep; 1,807 Oxen; 1,841 Horses; 3,270 Goats; 4,190 Pigs; 703 Dogs; and 1,873 Fowls and Geese."

The Wolf, savage though he be, is quite tamable; he has often shown great devotion to his master, and has, in fact, behaved in every respect like an affectionate Dog, a very interesting fact, as bearing upon the evolution of Dogs from wild *Canidæ*.

The most remarkable instance of this with which we have met is the following, which shows the Wolf to be—what one would never suspect him to be—capable of that almost superhuman affection, which is sometimes exhibited by Dogs:—"A lady near Geneva had a tame Wolf, which seemed to have as much attachment to its mistress as a Spaniel. She had occasion to leave home for some weeks. The Wolf evinced the greatest distress after her departure, and at first refused to take food. During the whole time she was absent he remained much dejected. On her return, as soon as the animal

YOUNG WOLVES.

heard her footsteps, he bounded into the room in an ecstasy of delight. Springing up, he placed one paw on each of her shoulders, but the next moment he fell backward and instantly expired."*

There are several varieties of the Wolf besides the common European kind, most of which have been considered by different authors as distinct species, and some of which are even now so considered, though the differences between them are so very slight and unimportant, that it seems hardly advisable to look upon them as anything more than *geographical species*—varieties produced by difference of climate and other surroundings.

"The Black Wolf is a name given to a variety which is most frequent in Southern Europe, and particularly in the Pyrenees, and to the south of those mountains, where they are more common than the ordinary Wolf, which the Black Wolf equals in stature, and, if anything, exceeds in strength. Cuvier says it is found, but very rarely, in France."

The Wolf found in Palestine, the subject of so many references in the Old Testament, is, according to Canon Tristram, a very well-marked variety. He says of it:—

"The Wolf is the dread of the shepherd from one end of the country to the other, and a single Wolf is far more destructive than a whole pack of Jackals. Again and again I have put up the Syrian Wolf and fired at it without success. Near Beersheba, in the hill country, in the forests of Bashan and Gilead, in the ravines of Galilee and Lebanon, and in the maritime plains, it is alike distributed. I never saw two together, and I never heard of them hunting in packs. It is much to be wished that some traveller may be able to secure a specimen for examination, for it may possibly prove to be a distinct variety. It is of a lighter fawn colour than any European Wolf I ever saw, and appears decidedly larger. I can confirm the statement of Dr. Russell, that the natives speak of another larger and fiercer species called 'Sheeb,' but I could never obtain any clear definition of the distinctions between the two."

The Wolf of India, abundant in the open country, rare in the wooded districts over the whole of the great peninsula, is considered, by authorities such as Mr. Blyth and Dr. Jerdon, as a distinct species, and is called *Canis pallipes*.

"The Wolves of the Southern Mahratta country," says Mr. Elliot, "generally hunt in packs, and I have seen them in full chase after the Goat-Antelope (*Gazella Bennettii*). They likewise steal round a herd of Antelopes, and conceal themselves on different sides, till an opportunity offers of seizing one of them unawares, as they approach, whilst grazing, to one or other of their hidden assailants. On one occasion three Wolves were seen to chase a herd of Gazelles across a ravine in which two others were lying in wait. They succeeded in seizing a female Gazelle, which was taken from them. They have frequently been seen to course and run down Hares and Foxes; and it is a common belief of the Ryots that in the open plains, where there is no cover or concealment, they scrape a hole in the earth, in which one of the pack lies down, and remains hid, while the others drive the herd of Antelopes over him. Their chief prey, however, is Sheep; and the shepherds say that part of the pack attack and keep the Dogs in play, while others carry off their prey, and that if pursued they follow the same plan, part turning and checking the Dogs, whilst the rest drag away the carcass till they evade pursuit. Instances are not uncommon of their attacking man. In 1824, upwards of thirty children were devoured by Wolves in one pergunnah alone. Sometimes a large Wolf is seen to seek his prey singly. These are called *Won-tola* by the Canarese, and reckoned particularly fierce."

This Indian Wolf has dingy reddish-white fur, some of the hairs being tipped with black; the lower parts are dingy white, the tail slightly tipped with black.

Closely allied to the Indian Wolf is a variety from Tibet, "*Canis laniger*, sometimes called the 'White Wolf' by sportsmen who cross the Himalayas. It is the Chángú of Tibet, *Chankodi*, near the Niti Pass from Kumaon; and it is a larger animal than the Indian Wolf, with white face and limbs, and no dark tip to the tail, which is fully brushed. The hair is extremely woolly," this peculiarity being, of course brought about by the cold climate to which the animal is exposed. Tibet also boasts another variety, the Red or Golden Wolf, which is fulvous, with greyish-brown head, and with the lower parts pure white. A third variety, with black shaggy fur, and sometimes known as *Canis niger*, exists in the same country.

The North American Wolf, which extends from Greenland in the north to Mexico in the south,

* Jesse: "History of the British Dog."

is often separately considered as *Canis occidentalis*. It differs from the European kind chiefly in its fur being finer, denser, and longer, and in the curious fact that its feet are, as Sir John Richardson remarks, very broad, so as to enable it to run easily on the snow. The development of these natural snow-shoes in the American Wolf fitting it so beautifully for its particular mode of life is highly interesting. This species is entirely absent from South America, but its wide distribution in North America may be gathered from Richardson's account:—

"Wolves are found in greater or less abundance in different districts, but they may be said to be very common throughout the northern regions; their footmarks may be seen by the side of every stream, and a traveller can rarely pass a night in these wilds without hearing them howling around him. They are very numerous on the sandy plains which, lying to the eastward of the Rocky Mountains, extend from the sources of the Peace and Saskatchewan Rivers towards the Missouri. There bands of them hang on the skirts of the Buffalo herds, and prey upon the sick and straggling Calves. They do not, under ordinary circumstances, venture to attack the full-grown animal; for the hunters informed me that they often see Wolves walking through a herd of Bulls without exciting the least alarm; and the marksmen, when they crawl towards a Buffalo for the purpose of shooting it, occasionally wear a cap with two ears, in imitation of the head of a Wolf, knowing from experience that they will be suffered to approach nearer in that guise."*

The American Wolf extends into Greenland, where the Eskimo take it in traps of a very novel construction, "made of strong slabs of ice, long and narrow, so that a Fox can with difficulty turn himself in it; but a Wolf must actually remain in the position in which he is taken. The door is a heavy portcullis of ice, sliding in two well-secured grooves of the same substance, and is kept up by a line, which, passing over the top of the trap, is carried through a hole at the farthest extremity; to the end of the line is fastened a small hoop of whalebone, and to this any kind of flesh bait is attached. From the slab which terminates the trap a projection of ice, or a peg of wood or bone, points inwards near the bottom, and under this the hoop is lightly hooked; the slightest pull at the bait liberates it, the door falls in an instant, and the Wolf is speared where he lies."

There are no less than five varieties of the North American Wolf, to all of which separate specific names have been given by authors. They are: the Common Grey Wolf (*Lupus griseus*), the White Wolf (*Lupus albus*), the Pied Wolf (*Lupus sticte*), the Dusky Wolf (*Lupus nubilus*), and the Black Wolf (*Lupus ater.*) All these differ from one another only in the lesser details of colouring and other minor characters. In their habits they resemble one another entirely, and it is therefore unnecessary to do more than mention them.

The Coyote, or Prairie Wolf† occurs, along with the common North American Wolf, as far south as Mexico; its northern range being about the 55th degree of latitude.

"The Prairie Wolf has much resemblance to the Common Grey Wolf in colour; but differs from it so much in size, voice, and manners, that it is fully entitled to rank as a distinct species. It inhabits the plains of the Missouri and Saskatchewan, and also, though in smaller numbers, those of Columbia. On the banks of the Saskatchewan, these animals start from the earth in great numbers on hearing the report of a gun, and gather around the hunter in expectation of getting the offal of the animal he has slaughtered. They hunt in packs, and are much more fleet than the Common Wolf. I was informed by a gentleman who has resided forty years on the Saskatchewan, and is an experienced hunter, that the only animal on the plains which he could not overtake, when mounted on a good Horse, was the Prong-horned Antelope, and that the Meesteh-chaggoneesh, or Prairie Wolf, was the next in speed."

"The fur of the Prairie Wolf is of the same quality with that of the Grey Wolf, and consists of long hairs, with a thick wool at their base. The wool has a smoky or dull lead colour; the long hairs on the back are either white for their whole length, or they are merely tipped with black. The prevailing colour along the spine is dark blackish-grey, sprinkled with white hairs. Its cheeks, upper lip, chin, throat, belly, and insides of the thighs, are white. There is a light-brown tint upon the upper surface of the nose, on the forehead, and between the ears, on the shoulders, on the sides, where it is mixed with grey, and on the outsides of the thighs and legs. The tail is grey and brown, with a black tip. Some individuals have a broad black mark on the shins of the fore-legs, like the European

* Richardson: "Fauna Boreali-Americana," 1829. † *Canis latrans.*

COYOTE, OR PRAIRIE WOLF.

Wolf. The ears are short, erect, and roundish, white anteriorly and brown behind. The tail is bushy, and is clothed, like the body, with wool and long hair. Some specimens want the brown tints, and have most of the grey colour."* The length of body and head together amounts to about three feet; that of the tail about fourteen or fifteen inches.

The Red Wolf (*Canis jubatus*) of Brazil shows considerable resemblance both to the Jackals and to the Foxes. It has long, slender legs, a slender snout, long ears, and stiff, shaggy, reddish hair, raised into a mane along the neck.

THE JACKAL.†

Next to the Wolf, the Jackal is the most important wild member of the Dog tribe. It is a much smaller animal than the Wolf, not exceeding thirty inches in length, and seventeen in height at the shoulder. It is also distinguished from Wolves and true Dogs by its curious, long pointed muzzle. Its fur is of a dusky-yellowish colour—whence its name of "Loup doré," or gilded Wolf, and its specific appellation *aureus*—"the hairs being mottled black, grey, and brown, with the under fur brownish-yellow, the lower parts yellowish-grey, tail reddish-brown, ending in a darkish tuft." There is a good deal of variation from this colour, depending partly on the time of year, partly on the locality.

The Jackal is a cowardly animal, blessed with a most evil smell and with a voracious appetite. It lives largely upon carrion, a good deal of which it gets as a sort of "perquisite" from the remains of the Lion's feast. It is sometimes called "the Lion's provider," a name which "may have arisen from the notion that the yell of the pack gives notice to the Lion that prey is on foot, or from the Jackals being seen to feed on the remnants of the Lion's quarry." Dr. Jerdon says, "it is a very useful scavenger, clearing away all garbage and carrion from the neighbourhood of Cape Town, but occasionally committing depredations among poultry and other domestic animals. Sickly Sheep and Goats usually fall a prey to him; and a wounded Antelope is pretty certain to be tracked and hunted to death by Jackals. They will, however, partake freely of vegetable food."

* Richardson.

† *Canis aureus.*

Like most other Dogs, the Jackal hunts in packs; and then, while on an expedition for food, makes night hideous by its fearful cries. In this it calls to mind the Hyæna, as well as in some other particulars, as, for instance, in its love for carrion, and in the remarkably cool way in which it will stare and laugh at travellers, as if holding them up to general ridicule.

The habits of the Jackal are altogether canine. Their hunts are conducted under the guidance of a leader, who is said to give the signal for every attack by a peculiar cry, and so powerful are these little animals in their union, that they are quite capable of pulling down a Deer. Their chief food in Ceylon seems to be Hares, the numbers of which they keep down to such an extent that those palatable Rodents are quite scarce in regions infested by Jackals.

The Jackal resembles, in one respect, the Fox, more than either the Wolf or Wild Dog. It has the reputation for excessive cunning, and indeed takes the place of our old vulpine friend, in the legends of the East. It is said that "when a Jackal has brought down his game and killed it, his first impulse is to hide it in the nearest jungle, whence he issues, with an air of easy indifference,

JACKAL.

to observe whether anything more powerful than himself may be at hand from which he might encounter the risk of being despoiled of his capture. If the coast be clear, he returns to the concealed carcass, and carries it away, followed by his companions. But if a man be in sight, or any other animal to be avoided, my informant has seen the Jackal seize a cocoa-nut husk in his mouth, or any similar substance, and fly at full speed, as if eager to carry off his pretended prize, returning for the real booty at some more convenient season."

Sir Emerson Tennent states that the Jackal, like the Domestic Dog, is subject to rabies, and that cattle frequently die from bites inflicted by them when in this condition.

"An excrescence is sometimes found on the head of the Jackal, consisting of a small horny cone, about half an inch in length, and concealed by a tuft of hair. This the natives call *Narri comboo;* and they aver that this 'Jackal's horn' only grows on the head of the leader of the pack. Both the Singhalese and the Tamils regard it as a talisman, and believe that its fortunate possessor can command, by its instrumentality, the realisation of every wish, and that if stolen or lost by him, it will invariably return of its own accord. Those who have jewels to conceal rest in perfect security, if along with them they can deposit a *Narri comboo,* fully convinced that its presence is an effectual safeguard against robbers.

"One fabulous virtue ascribed to the *Narri comboo* by the Singhalese is absurdly characteristic of their passion for litigation, as well as of their perceptions of the 'glorious uncertainty of the law.' It

is the popular belief that the fortunate discoverer of a Jackal's horn becomes thereby invincible in every lawsuit, and must irresistibly triumph over every opponent. A gentleman connected with the Supreme Court of Colombo has repeated to me a circumstance, within his own knowledge, of a plaintiff, who, after numerous defeats, eventually succeeded against his opponent by the timely acquisition of this invaluable charm. Before the final hearing of the cause, the mysterious horn was duly exhibited to his friends; and the consequence was that the adverse witnesses, appalled by the belief that no one could possibly give judgment against a person so endowed, suddenly modified their previous evidence, and secured an unforeseen victory for the happy owner of the *Narri comboo!*"

Jackals have often been tamed; and, under the circumstances, behave exactly like the Domestic Dog: they fawn upon their masters, wag their tails, and throw themselves on their backs with all four paws in the air, altogether like Dogs. The chief drawback to their domestication is their abominable smell; but it is stated by Colonel Sykes that a tame female Jackal in his possession was quite devoid

JACKAL OF SENEGAL.

of this odour, while a recently-caught male, which was placed with her, smelt so horribly as to be almost unapproachable.

The Common Jackal is found in Asia Minor, South-East Asia, including Persia and India, as far south as Ceylon, and in the North of Africa. The Black-backed Jackal (*Canis mesomelas*) is found in trans-Saharal Africa, from Nubia to the Cape. It is rather larger than the common kind, with longer ears and tail, a light red skin, with a black back-stripe. It is a very thievish animal, and is accused by some of the natives of eating off the tails of their Sheep.

The Jackal of Senegal (*Canis anthus*) is one of the best marked varieties of the Jackal, and has a strong claim to the distinction of a separate specific name. It is considerably larger than the common kind, more elegantly built, and has very long legs, almost like those of a Greyhound. It is of a bright tawny colour, with dark band on the back, side, and chest. It is one of the commonest animals in Central Africa, and "its habits are different to those of the Common Jackal. It is more prudent and suspicious, and is completely nocturnal. During the day it lies hidden in a safe retreat, and nothing but chance can reveal its presence to the hunter."

The Crab-eating Dog (*Canis cancrivorus*) is a Jackal approaching in many respects, especially in its long and bushy tail, to the Foxes. It is found in the savannahs of South America. The Aguara, or Azara's Fox (*Canis Azarae*), another South American species, is almost half-way between Jackals and Foxes, the latter of which it chiefly resembles in its long tail and short snout.

THE COMMON FOX.*

The Foxes form a very distinct group of *Canidæ*, differing far more from the Dog, Wolf, and Jackal than those animals do from one another. The most characteristic and important difference between them lies in the fact that in the Foxes the pupil of the eye contracts under the influence of strong light to a vertical slit, dilating and becoming circular again as the light diminishes. This is the case, as will be remembered, in the Common Cat, and many other members of the same family; it is, in fact, very usual in animals of nocturnal habits, which, being used under ordinary circumstances to make shift with the smallest quantity of light obtainable, are advantaged by being able to exclude all superfluous rays when the illumination becomes stronger than they can comfortably bear. Moreover, the muzzle of Foxes is much sharper than that of Dogs, the head more rounded, the ears erect and triangular, the limbs short, and the tail or "brush" long, thick, and bushy. On account of these

COMMON FOX.

differences, many naturalists prefer to separate the Foxes altogether from Dogs, Wolves, and Jackals, and make them constitute a new genus—*Vulpes*—the Common Fox being called *Vulpes vulgaris*.

The habits and appearance of the Fox are thoroughly well known, especially in Great Britain, where the life of this, the greatest marauder of the farmyard, is held in such high esteem, that in many places vulpicide is a crime of almost equal magnitude with homicide, and of far greater magnitude than uxoricide: at any rate, if the latter operation be only fairly conducted, *secundum artem*, with boots. In many counties, even now, the farmer who kills the pillager of his poultry-yard, instead of leaving him to come by his death in the hunting-field, is promptly "sent to Coventry," and often obliged to pack up, bag and baggage, and try his fortune in another locality. The Fox, indeed, must be brought to justice for no crime he may commit, however great; but when his time is up, he must be hunted to death with an army of Dogs, each one twice his own size, and his dying struggles witnessed by scores of horsemen and horsewomen, who are considered to have done great things if they are "in at the death" of the insignificant little thing, which ought to have been knocked on the head long ago.

The cunning of the Fox is proverbial. When hunted, he "makes a thousand shifts to get away," and often succeeds in baffling the whole pack of well-trained Hounds. His stealthy tread, as he winds along the hill sides and valley slopes to seek his prey or to reach his lair, is altogether characteristic of one thoroughly well up to his work. Numberless tales are told of his sagacity, but we will content

* *Canis vulpes.*

ourselves with one which forms almost as good an example of animal reason as any we have met with, even in the Dog:—

"A farmer in Bogside, Beith, of the name of Fleming, was looking out of his window one summer's morning, about three o'clock, when he saw a Fox crossing a field before it, carrying a large Duck which he had captured. On coming to a stone dyke, about four feet high, on the side of the field, Reynard made an effort to leap over it with his prey, but failed, and fell back into the field. After making three attempts, with the same result, he sat down, and viewed the dyke for a few minutes; after apparently satisfying himself, he caught the Duck by the head, and standing up against the dyke with his fore-paws as high as he could reach, he placed the bill of the Duck in a crevice in the wall; then springing upon the top he reached down, and pulling up the Duck, dropped it upon the other side, leaped down, and picking it up, went on his way."

The Common Fox is found, under more or less well-marked varieties, some of which are often elevated to the rank of species, over the greater part of Europe, Asia, and North Africa, and in many parts of America.

THE ARCTIC FOX.*

This is an extremely well-marked species of Fox, found in the southern and central parts of Greenland, and extending high up Smith's Sound. It is sometimes seen during the Seal-hunting season hundreds of miles from land, on the frozen sea, where it has wandered to feast on the dead Seals.

It is usually stated that the colour of the skin of this animal varies with the season—that in summer it is of a blue-grey colour, while in winter it is perfectly white; these colours, of course, serving as a protection to the animal: the blue harmonises well with the rocky shore and the thick, dark ice, while the winter coat is perfectly indistinguishable on the snow, with which the ground is then thickly strewn. But according to a writer of high authority, Dr. Robert Brown, this is all a mistake. The white and blue colours are distinctive of separate varieties of the Arctic Fox, and not of the same animal at different seasons; the colour in each case being wholly independent of the time of year. The length, from snout to root of tail, is about two feet, that of the tail itself about a foot.

An interesting account of the manners and customs of this pretty little animal is given by Sir J. Richardson, who says:—

"The Arctic Fox is an extremely cleanly animal, being very careful not to dirt those places in which he eats or sleeps. No unpleasant smell is to be perceived, even in a male, which is a remarkable circumstance. To come unawares on one of these creatures is, in my opinion, impossible; for even when in an apparently sound sleep, they open their eyes at the slightest noise which is made near them, although they pay no attention to sounds when at a short distance. The general time of rest is during the daylight, in which they appear listless and inactive; but the night no sooner sets in than all their faculties are awakened: they commence their gambols, and continue in unceasing and rapid motion until the morning. While hunting for food, they are mute, but when in captivity or irritated, they utter a short growl, like that of a young puppy. It is a singular fact that their bark is so undulated as to give an idea that the animal is at a distance, although at the very moment he lies at your feet. Although the rage of a newly-caught Fox is quite ungovernable, yet it very rarely happened that on two being put together they quarrelled. A confinement of a few hours often sufficed to quiet these creatures; and some instances occurred of their being perfectly tame, although timid, from the first moment of their captivity. On the other hand, there were some which, after months of coaxing, never became more tractable. These, we supposed, were old ones.

"Their first impulse on receiving food is to hide it as soon as possible, even though suffering from hunger, and having no fellow-prisoners of whose honesty they are doubtful. In this case, snow is of great assistance, as being easily piled over their stores, and then forcibly pressed down by the nose. I frequently observed my Dog-Fox, when no snow was attainable, gather his chain into his mouth, and in that manner carefully coil it so as to hide the meat. On moving away, satisfied with his operations, he of course had drawn it after him again, and sometimes with great patience repeated his labours five or six times, until in a passion he has been constrained to eat his food without its having been rendered luscious by previous concealment. Snow is the substitute for water to these creatures, and

* *Canis lagopus.*

on a large lump being given to them, they break it in pieces with their feet, and roll on it with great delight. When the snow was slightly scattered on the decks, they did not lick it up, as Dogs are accustomed to do, but by repeatedly pressing with their nose collected small lumps at its extremity, and then drew it into the mouth with the assistance of the tongue." In another passage, Captain Lyon, alluding to the above-mentioned Dog-Fox, says, "He was small and not perfectly white; but his tameness was so remarkable, that I could not afford to kill him, but confined him on deck in a small hutch with a scope of chain. The little animal astonished us very much by his extraordinary sagacity: for, during the first day, finding himself much tormented by being drawn out repeatedly by his chain, he at length, whenever he retreated to his hut, took this carefully up in his mouth, and drew it so completely after him that no one who valued his fingers would endeavour to take hold of the end attached to the staple."

The Eskimo take the Arctic Foxes in traps, which are described by Captain Parry as being "extremely simple and ingenious. They consist of a small circular arched hut, built of stones, having a square aperture at the top, but quite close and secure in every other part. This aperture is closed by some blades of whalebone, which, though in reality only fixed to the stones at one end, appear to form a secure footing, especially when the deception is assisted by a little snow laid on them. The bait is so placed that the animal must come upon this platform to get at it, when the latter, unable to bear the weight, bends downwards, and after precipitating the Fox into the trap, which is made too deep to allow of his escape, returns by its elasticity to its former position, so that several may then be caught successively." They are also taken in the wolf-traps of ice; and all the rocky islands lying off the mouth of the Coppermine River are studded with square traps, built of stone, by the Eskimo, wherein the Fox is killed by a flat stone falling upon him when he pulls at the bait.

The skins of both the white and the blue Fox are important articles of commerce, but the blue variety, being much rarer than the white, is far more valuable, the price for it being six or seven times as much as that of the white.

THE FENNEC.*

This is a pretty little Fox-like animal, about ten inches long, not including the tail, which measures about five inches and a quarter. The fur is of a whitish hue, the cheeks large, and the snout sharp, just like those of a true Fox; but the ears distinguish it at once: they are quite erect, and nearly three inches and a half long, that is, considerably longer than the whole head.

The Fennec is found in the whole of Africa, and has also been described as occurring at Bushire, on the shores of the Persian Gulf. It was first noticed by the African traveller, Bruce, who kept a specimen as a pet. The favourite food of this animal "consisted of dates or any sweet fruit; but he was also very fond of eggs. He would eat bread when hungry, more especially if it was rendered palatable by honey or sugar. The sight of a bird aroused him to eager watchfulness as long as it was present; and a Cat was his aversion. He would endeavour to hide from the latter, but never showed a disposition to resist or defend himself. The animal was disposed to sleep by day, but as night came on he became restless to excess. Bruce never heard it utter any sound. He says that the animal is described in many Arabian books under the name of El Fennec, by which appellation he states that it is known all over Africa; and he conceives that the word is derived from the Greek *Phoinix*, a palm or date-tree, adding that the animal builds his nest on trees, and does not burrow in the earth."

The fondness of the Fennec for vegetable food is curious, as most of the wild *Canidæ* have so marked a preference for animal food. Bruce's statement quite bears out the main fact in the old fable of "The Fox and the Grapes," as well as that in the "Song of Songs"—"Take us the Foxes, the little Foxes, that spoil the vines: for our vines have tender grapes."

On the shores of the Persian Gulf, the Fennec is sometimes hunted with Dogs, and will often take to the sea to escape from its enemies. Fennec-hunting is likely to be good sport, as the long-eared little creature is extremely plucky and enduring. In Africa, according to Sir John Kirk, "these animals hunt in packs. Although inferior in speed to the Antelope, they will run him down, and at last wear him out; even the Buffalo they are said sometimes to kill."

* *Canis zerda.*

FENNECS AND JERBOAS.

THE LONG-EARED FOX.*

This very extraordinary little animal is found only in South Africa. It has somewhat the appearance of a Fennec, but the bushy tail is straight and comparatively short, being not more than half the length of the body and head, which together are about two feet long. The ears are of great size, and the snout is very short and pointed. The skin is of a greyish-yellow colour, white beneath, and the tail is darker than the rest of the body. It differs from all other Canidæ in having no less than six additional molar teeth, two on each side of the upper, one on each side of the lower jaw.† Some of the teeth, too, show an approximation in form to those of the Civets. For these reasons it is, like the two following animals, placed in a separate genus from the rest of the Canidæ.

THE RACOON DOG.‡

This is another member of the family, the peculiarities of which are so great as to necessitate its being placed in a separate genus. It is very different from an ordinary Dog, and has the look of a Racoon, which, as we shall see afterwards, is a member of one of the families of Arctoidea, and far removed from the Dogs. The body is covered with long brown fur; the ears are short and rounded. The back is curiously arched, almost like that of a Marten or Weasel; the legs are short and slender. The body attains a length of almost twenty-eight inches; the prettily-feathered tail is about four inches in length. The teeth equal in number those of ordinary Dogs.

THE HYÆNA-DOG.§

This curious animal, sometimes called the "Cape Hunting Dog," is found over the greater part of trans-Saharal Africa, being especially abundant in the neighbourhood of Cape Colony. Of all the Cynoids it is the species which shows the greatest approximation to the Æluroid type. It is, to all intents and purposes, a Dog, but yet in some few respects shows a decided relationship with the Hyænas; for instance, the back slopes slightly towards the hinder quarter, the muzzle is black, and of that ugly snub-nosed character so characteristic of Hyænas, the ears are long and straight, and the tail scanty. It differs also from the true Dogs in having only four toes on all the feet, instead of five on the fore feet and four on the hind feet. The skull and teeth are quite Cynoid in character: the former presenting only one single slight and unimportant point in which it tends to resemble that of a Hyæna.

The Lycaon is about the size of a Wolf. Its skin varies a good deal in its markings. "White, black, and yellow ochre are its chief tints; the white predominates in some, the black in others, and forms the fundamental colours; the spots are very irregular, sometimes large, sometimes small, very varyingly disposed on the surface of the body; the white and ochreous spots are always mixed with black. The colouration of the head is the most constant; the muzzle is black up to the eyes; and black bands are prolonged between the eye and ear, along the top of the head, to the neck. The tail is usually tolerably regular in colouration: it is ochreous at the root, black in the middle, white or ochreous at the tip; the eyes are brown."

The Hyæna-Dogs are partly diurnal, partly nocturnal in their habits. They like fresh meat, and are, at the same time, partial to carrion.

"These animals invariably hunt together in large organised packs, varying in numbers from ten to sixty, and by their extraordinary powers of endurance and mode of mutual assistance, they are enabled to run into the swiftest and overcome the largest and most powerful Antelope. Their pace is a long, never-tiring gallop, and in the chase they relieve one another, the leading Hounds falling to the rear when fatigued, when others who have been husbanding their strength come up and relieve them. Having succeeded in bringing their quarry to bay, they all surround him, and he is immediately dragged to the ground, and in a few minutes torn to pieces and consumed.

"Their voices consist of three different kinds of cry, each being used on special occasions. One of their cries is a sharp angry bark, usually uttered when they suddenly behold an object which they cannot make out. Another resembles a number of Monkeys chattering together, or con-

* *Megalotis Lalandii.*

† The dental formula is, therefore, incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{4-4}{4-4}$ = 48.

‡ *Nyctcrentes procyonides.* § *Lycaon pictus.*

HYÆNA DOG.

versing when their teeth are chattering violently from cold. This cry is emitted at night, when large numbers of them are together and they are excited by any particular occurrence, such as being barked at by Domestic Dogs. The third cry, and the one most commonly uttered by them, is a sort of rallying note to bring the various members of the pack together when they have been scattered in following several individuals of a troop of Antelopes. It is a peculiarly soft and melodious cry, yet, nevertheless, may be distinguished at a great distance. It very much resembles the second note uttered by the Cuckoo, which visits our island during the summer months; and when heard on a calm morning echoing through the distant woodlands, it has a very pleasing effect." *

CHAPTER X.

THE BEAR FAMILY.—THE BEARS.

Characters of the URSIDÆ—Their Mode of Progression—Teeth—Skull—Geographical Distribution—THE BROWN BEAR—Its Occurrence—Character—Habit of Hibernating—Diet—Moral Characteristics—Bear-baiting—Varieties—THE AMERICAN BLACK BEAR—Its Habits—Superstitions of the Indians regarding it—THE GRIZZLY BEAR—THE SYRIAN BEAR—THE HIMALAYAN BEAR—THE SUN BEAR—THE SLOTH BEAR—Its Ant-and Bee-eating Propensities—THE SPECTACLED BEAR—THE POLAR BEAR—Its Size—Characteristics—Habits—Method of Hunting—The supposed Poisonous Properties of its Liver.

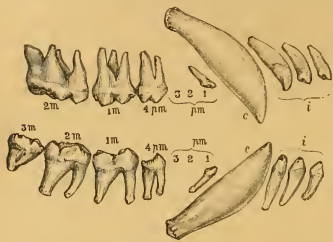
THE BEAR FAMILY.†

WE now come to the last group of Carnivora—that of the Arctoidea—and to a family which forms an extreme limit to the long series, of which the Dogs constitute the centre, and the Cats the opposite end.

* Gordon Cumming quoted by A. Murray: "Geographical Distribution of Mammals." † *Ursidæ.*

The latter, as we have already seen, culminate in one direction—that is, they attain the perfection of structure for a predatory life and flesh diet. The members of the Dog family, again, are flesh-eaters, as a rule, but not exclusively. They are well adapted for hunting and catching living prey, but by no means so perfectly as the Cats; they are, indeed—from a carnivorous point of view—the inferiors of the Feline group in teeth, in claws, and in muscular strength and agility.

The Bears, with which we have now to do, depart as widely from the Dogs in one direction as the Cats in the other; and their distance from the latter family is great indeed. The Cats attain the perfection of quadrupedal form, while few animals are more clumsy and awkward-looking than a Sloth Bear. Cats walk, with an elegant and silent tread, on the very tips of their toes; Bears shuffle along with a waddling, though often rapid gait, and with the whole sole of both fore and hind feet applied to the ground, or, in other words, are wholly plantigrade. Cats have a clean-cut, rounded face, with beautifully chiselled nostrils and thin lips; Bears a long snout, almost like a Pig's. The fur of Cats is usually short and brilliantly coloured; that of Bears long, shaggy, and sombre. Lastly, while the Cats are almost exclusively flesh-eaters, many Bears are strict vegetarians, or at most eat such matters as Ants and honey, and only have recourse to meat when their favourite food cannot be had.

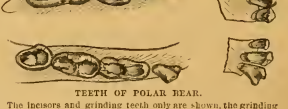


TEETH OF POLAR BEAR.

i, incisors; *c*, canines; pm, premolars (the second and third of which are absent in both jaws); m, molars.

In correspondence with the partly or entirely vegetable nature of the Bear's diet, we find a remarkable series of modifications in its teeth. The front teeth, or incisors, are of considerable size, and have three points or cusps. The great eye-teeth, or canines, although large and formidable, are decidedly smaller in relation to the rest of the teeth than in either the Dog or Cat group. Following these are three very small teeth, which usually fall out at an early period, and are, therefore, not to be found in most skulls; these, as well as the next tooth, which is of considerable size, have their places occupied in the young Bear by "milk-molars," and are therefore called premolars. The last premolar in the upper jaw is succeeded by two, that in the lower jaw by three, true grinders or molars; so that the "dental formula" of the Bear is the same as that of the Dog, namely, incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{2-2}{3-3}$.

But though the number agrees, the form is very different. The incisors and canines, as we have said, exhibit no difference of importance, but the last premolar and all the molars, instead of having the sharp cutting character they have in the Cat, and to a less degree in the Dog, have comparatively flat crowns, raised up into a number of little elevations or tubercles; even the "carnassial" teeth (last premolar in the upper jaw, and first molar in the lower) have entirely lost their scissor-blade character, and become true grinders. As a corresponding change, the hinge of the lower jaw is no longer so constructed as to be incapable of any but an up and down motion; it can, on the contrary, be worked from side to side, so that the Bear can actually *chew* his food. The animal derives a double advantage from this: in the first place, the food can be reduced to a pulp, a very necessary thing for such food-materials as roots, which in an entire state would be highly indigestible; and, in the second place, it is acted upon for a considerable time by the saliva, and thus partially digested in the mouth, for one of the chief properties of saliva is to convert the insoluble, and therefore indigestible, starchy matter, of which a large part of most vegetable substances consists, into soluble, and therefore digestible, sugar.



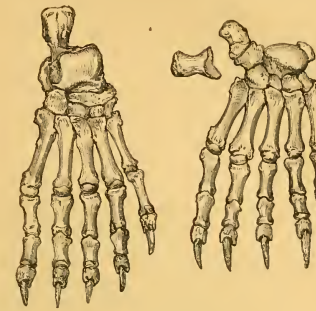
TEETH OF POLAR BEAR.

The incisors and grinding teeth only are shown, the grinding surfaces of the latter being displayed.

It is a remarkable circumstance that the teeth have the same form in all the Bears: though,

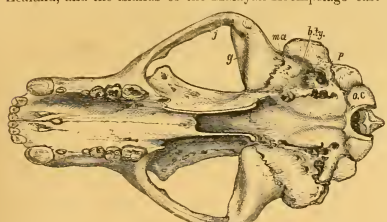
as we shall see, while most of them are wholly or largely herbivorous, some, such as the Polar Bear, are almost entirely of flesh-eating habits, and one would naturally expect a difference in the teeth. Curiously enough, however, no such difference is apparent.

The Bears have five toes to each foot, all armed with long curved claws. In the skull the floor of the drum cavity of the ear is hardly at all dilated, so that there can scarcely be said to be a *bulla tympani* at all; moreover, a bony passage of considerable length leads from the drum to the exterior, instead of the aperture being flush with the wall of the drum, as in the Cats. As we have seen, the Cats have a small *cæcum*, or blind process, to the intestine, and the Dogs one of considerable size. In the Bear this appendage is wholly absent.



FEET OF BEAR.

Bears are found over a large part of the world, in Europe, Asia, North and South America, and North Africa. They are, however, wholly absent from what is termed trans-Saharal Africa, that is, the part of the continent south of the great Sahara Desert; and are also not to be found in any part of the Australian region, or, in other words, in Australia, Tasmania, New Zealand, and the islands of the Malayan Archipelago east of Wallace's line. They thus have a far more restricted distribution than either of the other two chief families of Carnivora—the *Felidæ* and *Canidæ*.



UNDER VIEW OF BEAR'S SKULL.

oc, occipital condyle; *p*, paroccipital process; *bty*, bulla tympani; *ma*, external auditory passage; *g*, glenoid cavity; *j*, jugular arch.

THE COMMON BROWN BEAR.*

The Brown Bear is the commonest member of the whole family, and has been known from very early periods. It was, indeed, for a long time the only species known to Linnæus, who recognised no other kind up to the tenth edition of his great work, when he doubtfully admitted the Polar Bear.

The Brown Bear is found in many parts of Europe—Norway, Russia, Central Europe, Spain, &c.—in Siberia, Kamtchatka, and Japan, and in a part of the Arctic regions of North America. In former times it was found in Britain, whence it was imported by the Romans, under the name of the Caledonian Bear, for the sports of the amphitheatre. "Ray quotes authority for the Brown Bear being one of the Welsh beasts of chase; and Pennant adduces the places which retained the name of Pennarth, or the Bear's Head, as evidence that it existed in that principality. In the 'History of the Gordons' it is stated that one of that family, so late as the year 1057, was directed by the king to carry three Bears' heads on his banner, as a reward for his valour in slaying a fierce Bear in Scotland." It is, however, quite possible that this valorous Gordon may be a mythical personage, or that he may have lived at a much earlier period than that to which his exploit is assigned.

The Brown Bear is an awkward-looking brute, with sprawling gait, heavy body, and no tail to speak of. It is about six feet long, and about three or three and a half feet high at the shoulder. Its fur is longish, rather woolly, and of a dark brown hue. It lives a solitary life, and, like many of

* *Ursus arctos.*

its kin, has the curious habit of *hibernating*. During the summer, when food is abundant, it lays in a very large stock of provisions, thereby becoming immensely fat. This operation being satisfactorily performed by the beginning of winter, the Bear, finding that his foraging operations become more and more arduous, seeks out a resting-place, such as a hollow tree or a cavern, or if these are not to be had, makes a sort of rude hut or nest for himself of branches and moss, and then goes into winter quarters, and calmly settles down for a post-prandial slumber, which lasts until spring. He then emerges from his hiding-place, very thin and weak—altogether a mere ghost of his former self—and immediately sets about repairing his losses by as many hearty meals as he can possibly cram into the time at his disposal, or as the means at his command will allow.

The Bear feeds chiefly on roots, berries, and other vegetables; it has also a fondness for Ants, and a perfect passion for honey, in the capture of which he is often severely stung about the nose—almost

COMMON BROWN BEAR.

his only vulnerable part—by the infuriated inhabitants of the comb. He also preys upon small quadrupeds, and sometimes—especially when fully adult—on larger ones. He is occasionally bold enough to attack the Bull, but is, as often as not, worsted in the encounter. He rarely attacks man, unless provoked, and then, when his blood is up, is a most dangerous antagonist. His mode of attack is peculiarly his own. He does not fell his victim with a blow of his paw like one of the larger Cats, or seize it at once with his teeth like a Dog, but "gives it the hug"—embraces it tightly, and with a great show of affection, with its powerful fore limbs, and continues the squeeze until the wretched animal is suffocated. The female Bear, especially when her family is about, is a particularly ferocious creature. Her savageness is, indeed, proverbial; she is devoted to her cubs, and any one threatening their safety does so at his own peril.

The Bear is not only an affectionate mother, but is capable of a very firm friendship, as the following anecdote, related by Mr. Andersson,* shows. He tells us that, amongst a collection of animals he possessed "were two Brown Bears—twins—somewhat more than a year old, and playful as kittens when together. Indeed, no greater punishment could be inflicted upon these beasts than to disunite them, for however short a time. Still, there was a marked contrast in their dispositions: one of them was

* "Lake 'Ngami."

good-tempered and gentle as a lamb, while the other frequently exhibited signs of a sulky and treacherous character. Tempted by an offer for the purchase of the former of these animals, I consented, after much hesitation, to his being separated from his brother.

"It was long before I forgave myself this act. On the following day, on my proceeding, as usual, to inspect the collection, one of the keepers ran up to me, in the greatest haste, exclaiming, 'Sir, I am glad you are come, for your Bear has gone mad!' He then told me that during the night the beast had destroyed his den, and was found in the morning roaming wild about the garden. Luckily, the keeper managed to seize him just as he was escaping into the country, and, with the help of several others, succeeded in shutting him up again. The Bear, however, refused his food, and raved in so fearful a manner that, unless he could be quieted, it was clear he would do mischief.

"On my arrival at his den, I found the poor brute in a most furious state, tearing the wooden floor with his claws, and gnawing the barricaded front with his teeth. I had no sooner opened the door than he sprang furiously at me, and struck me repeated blows with his powerful paws. As, however, I had reared him from a cub, we had too often measured our strength together for me to fear him now; and I soon made him retreat into the corner of his prison, where he remained howling in the most heartrending manner. It was a most sickening sight to behold the poor creature, with his eyes bloodshot and protruding from the sockets, his mouth and chest white with foam, and his body crusted with dirt. I am not ashamed to confess that at one time I felt my own eyes moistened. Neither blows nor kind words were of any effect: they only served to irritate and infuriate him; and I saw clearly that the only remedy would be either to shoot him or to restore him to his brother's companionship. I chose the latter alternative; and the purchaser of the other Bear, my kind friend, Sir Henry Hunloke, on being informed of the circumstance, consented to take this one also."

A more curious case is related by Brehm, who tells us of a little boy who crept one night for warmth and shelter into the cage of an extremely savage Bear. The latter, instead of devouring the child, took him under its protection, kept him warm with the heat of its body, and allowed him to return every night to its cage. The poor boy soon died of small-pox, and the Bear from henceforth refused all food, and soon followed its little *protégé* to the grave.

In former times, the Bear was in great requisition in England for the noble sport of Bear-baiting. Bear gardens existed in many parts of the metropolis, in which the unlucky animals were baited to death with Dogs, for the delectation of our most religious and gracious sovereign, good Queen Bess, and "his sowship," her successor. The office of keeper of the Bear Ward was considered quite an honourable post, and was usually held by one of "Her Majesty's Servants," the players—by such men, for instance, as Betterton and Alleyn the founder of Dulwich College. It has always been the custom, too, to train Bears to walk on their hind legs and dance. This they do much more easily than a Dog or a Cat, on account of their broad soles.

The Brown Bear, like most animals, differs more or less in minor characters according to the country in which it is found. The Bear of the Pyrenees and of Austria, for instance, is described as having, in the young condition, yellowish-white fur and black feet. Sir J. Richardson describes a well-marked variety as occurring in North America; this, which is quite distinct from the Grizzly and Black Bears, he calls the Barren-ground Bear.

THE AMERICAN BLACK BEAR.*

This animal is distinguished from the common Brown Bear, not only by its black fur, but by its slenderer snout, more convex forehead, and smaller size: it rarely exceeds five feet in length. Its habits are more strictly vegetarian than those of the brown kind. "Its favourite food appears to be berries of various kinds, but when these are not to be procured, it preys upon roots, insects, fish, eggs, and such birds or quadrupeds as it can surprise. It does not eat animal food from choice; for when it has abundance of its favourite vegetable diet, it will pass the carcass of a Deer without touching it."

It usually hibernates—at any rate, when able to obtain a sufficiently plentiful meal, or rather series of meals, before the commencement of winter. Sometimes, however, when food is scarce, Bears will roam about the whole winter, never being able to obtain a sufficiently good feed to warrant their

* *Ursus americanus.*

going, with any safety or comfort, into permanent winter quarters. With regard to the hibernating Bears a very remarkable fact is mentioned by Sir J. Richardson, who is a most cautious and accurate writer, namely, that when the Bear "comes abroad in the spring it is equally fat" (as it was at the commencement of winter), "though in a few days thereafter it becomes very lean."

The Indians have an unbounded reverence for the Bear. When they kill one, they make exculpatory speeches to it, give it tobacco to smoke, call it their relation, grandmother, &c., and try in every possible way to appease its *manes*. They then cook and eat it with great gusto.

GRIZZLY BEAR.

THE GRIZZLY BEAR.*

This animal, which inhabits the region of the Rocky Mountains as far south as Mexico, is the most savage member of the whole family, and is more dreaded by Indian and Canadian trappers than any other. It is stated to attain a length of nine feet and a weight of eight hundred pounds, so that it greatly exceeds the Brown and Black Bears in size, and approaches in these respects to the Polar Bear. Its strength is enormous. "It has been known to drag to a considerable distance the carcass of a Buffalo, weighing about one thousand pounds."

The fur is of a dark-brown colour, with a good deal of grey on the head, and is of an inferior

* *Ursus ferox.*

quality to that of the brown and black kinds. It is also distinguished from the latter by shorter and more conical ears, by very long, arched, white claws, and by the ridiculously small size of its tail, which is completely hidden by the surrounding fur. "It is a standing joke among the Indian hunters, when they have killed a Grizzly Bear, to desire any one unacquainted with the animal to take hold of its tail."

The Grizzly is much more carnivorous in its habits than other Bears, and its ferocity is so great that it will often attack man unprovoked. "The young Grizzly Bears and gravid females hibernate, but the older males often come abroad in the winter in quest of food."

ISABELLINE, OR INDIAN WHITE BEAR.

THE SYRIAN BEAR *

This animal, a fine specimen of which is in the Zoological Gardens, is the Bear of which we have the oldest historical record. It was an animal of this species that was slain by David during his shepherd's career; and two females of the same kind are stated to have attacked the mockers of Elisha, and to have killed forty-two of them.

The Syrian Bear is found in the mountains of Palestine, and especially in Lebanon; a variety, known as the Indian White Bear,† occurs in the Himalayas. It is of a yellowish-brown colour, but this hue varies somewhat according to sex and the season of the year. The claws are smaller than in any of the foregoing species, and, as in the Brown Bear, the diet is usually of a vegetable nature, recourse being had to animal food only in times of necessity.

* *Ursus syriacus.* † *Ursus isabellinus.*

THE SUN BEARS.*

Under the name of "Sun Bear" are often included two very different species, the Himalayan Bear, Indian Black Bear, or Tibetan Sun Bear (*Ursus tibetanus*), and the Malayan Bear or Bruang (*U. malayanus*). The latter differs in certain comparatively unimportant respects from all the forms we have yet described, and is, therefore, sometimes separated as a distinct genus (*Helarctos*).

MALAYAN SUN BEAR.

The Himalayan Bear is found in Nepaul, Assam, Eastern Siberia, and China. It is about the size of the American Bear, and, like it, has close black fur, and a body and head more slender than those of the Brown or Syrian Bear. It is further distinguished by its white chin, by a broad white Y-shaped mark on the chest, and by a collar of longish hairs on the shoulders.

The Malayan Bear, called Bruang by the Malays, is found in the Malayan Peninsula, and in

* *Ursus tibetanus* and *U.* (*Helarctos*) *malayanus*.

POLAR BEARS. (*See pp.* 174–6.)

(From the Living Specimen in the Zoological Gardens, London.)

the adjacent islands of Borneo, Sumatra, and Java. It is much smaller than the Himalayan Bear, not exceeding four feet and a half in length. The fur is black, becoming brownish on the nose, and the chest is marked with a crescentic white mark, or, in the Bornean variety of the species, by a heart-shaped, orange-coloured patch. The claws are remarkably long.

The habits of the two species differ but little. In summer, according to Dr. Jerdon, the Sun Bear "is generally found at a considerable elevation, nine to twelve thousand feet or so, and often close to snow; but in winter it descends to five thousand feet, and even lower sometimes. It lives chiefly on fruits and roots, apricots, walnuts, apples, currants, &c.; also on several grains, barley, Indian corn, buckwheat, &c.; and in winter chiefly feeds on various acorns, climbing the oak trees and breaking down the branches. . . . They are very fond of honey. Now and then they will kill Sheep, Goats, &c., and are occasionally said to eat flesh. . . . This Bear has bad eyesight, but great power of smell, and if approached from windward is sure to take alarm. A wounded Bear will sometimes show fight, but in general it tries to escape. It is said sometimes to roll itself into the form of a ball, and then roll down steep hills, if frightened or wounded. If met suddenly, when there is no means of escape, it will attack man at once; and curious to say, it always makes for the face, sometimes taking off most of the hairy scalp, and frightfully disfiguring the unfortunate sufferer. There are few villages in the interior where one or more individuals thus mutilated are not to be met with."*

The Sun Bears are distinguished in menageries for their gift of walking about on their hind legs, which they do in a curiously human manner. This mode of progression seems sometimes to be adopted in the wild state. Both species are noticeable, in their state of captivity in the Zoological Gardens, for the antics they perform. The Himalayan Bears play with one another like two awkward boys, stand on their hind legs to wrestle, then fall down, and roll over and over, biting and hugging in the most laughable manner. The Malayan Bear is even more amusing. When the keeper gives it one of the hard biscuits on which it is fed, it will sometimes lie down on its back, and hold the biscuit now with its fore paws, now with both fore and hind paws, swaying about all the time, and expressing its satisfaction by the most comical noises.

Mr. Swinhoe quotes some curious notions entertained by the Chinese respecting the Sun Bear. They are contained in the native publication already referred to, *The Hainan Gazetteer*. "*Heirng* [or Bear] is fond of climbing trees and panting. Its gall in spring is in its heel, in summer in its belly, in autumn in its left paw, in winter in its right paw. About its heart there is a white fat, like jade, the taste of which is extremely fine: this is usually called 'Bear's white.' In winter the Bear lies torpid, and does not eat. When hungry, it licks its own paws, and thence the goodness in the paws."

THE SLOTH BEAR.†

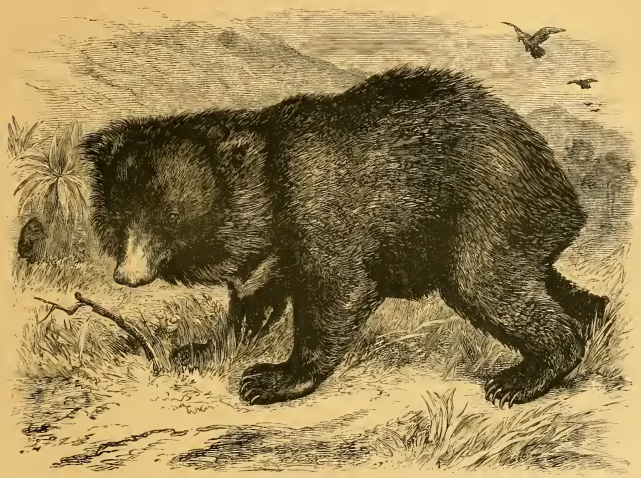
This curious and ungainly-looking beast is another of the Indian Bears, being found "throughout India and Ceylon, from Cape Comorin to the Ganges." It is distinguished by its extremely awkward shape, its long shaggy hair, its prolonged and very flexible snout and lower lip, all of which peculiarities combine to give it a remarkable and anything but prepossessing appearance. The fur is mostly black, the muzzle and the tips of the feet being of a dirty white or yellowish colour, and the breast ornamented with a V-shaped or crescentic mark. It attains a length of between five and six feet.

The Sloth Bear feeds on Ants, honey, fruit, &c. "The power of suction in the Bear, as well as of propelling wind from its mouth, is very great. It is by this means enabled to procure its common food of white Ants and larvæ with ease. On arriving at an Ant-hill, the Bear scrapes away with the fore feet until he reaches the large combs at the bottom of the galleries. He then, with violent puffs, dissipates the dust and crumbled particles of the nest, and sucks out the inhabitants of the comb by such forcible inhalations as to be heard at two hundred yards' distance or more. Large larvæ are in this way sucked out from great depths under the soil. When Bears abound their vicinity may be readily known by numbers of these uprooted Ants' nests and excavations, in which the marks of their claws are plainly visible. They occasionally rob birds' nests, and devour the eggs."‡

* Jerdon: "Mammals of India." † *Ursus* (or *Melursus*) *labiatus*. ‡ Tickell, quoted by Jerdon.

The capture of Ants is, however, by no means always devoid of inconvenient consequences for the ursine ravisher. The insects are as brave and ferocious as they are industrious, and their strong sharp mandibles are capable of making a considerable impression upon the snout, lips, and eyelids of their huge enemy.

Like the Sun Bear, the Sloth Bear rarely attacks man unless provoked, but, like it, is, when attacked, a most dangerous antagonist, always making for the face, and especially the eyes. Both in Ceylon and in India the natives have a very wholesome dread of the animal, and, indeed, fear his onslaught more than that of any other beast. "Among the Singhalese there is a belief that certain charms are efficacious in protecting them from the violence of Bears, and those whose avocations expose them



SLOTH BEAR.

to encounters of this kind are accustomed to carry a talisman, either attached to their neck or enveloped in the folds of their luxuriant hair. A friend of mine, writing of an adventure which occurred at Anarajapoora, thus describes an occasion on which a Moorman, who attended him, was somewhat rudely disabused of his belief in the efficacy of charms upon Bears:—'Desiring to change the position of a herd of Deer, the Moorman (with his charm) was sent across some swampy land to disturb them. As he was proceeding, we saw him suddenly turn from an old tree and run back with all speed, his hair becoming unfastened, and, like his clothes, streaming in the wind. It soon became evident that he was flying from a terrific object, for he had thrown down his gun, and, in his panic, he was taking the shortest line towards us, which lay across a swamp covered with sedge and rushes, that greatly impeded his progress, and prevented us approaching him or seeing what was the cause of his flight. Missing his steps from one hard spot to another, he repeatedly fell into the water, but he rose and resumed his flight. I advanced as far as the sods would bear my weight, but to go further was impracticable. Just within ball range there was an open space, and as the man gained it, I saw that he was pursued by a Bear and two cubs. As the person of the fugitive covered the Bear, it was impossible to fire

without risk. At last he fell exhausted, and the Bear being close upon him, I discharged both barrels. The first broke the Bear's shoulder; but this only made her more savage, and rising on her hind legs, she advanced with ferocious growls, when the second barrel—though I do not think it took effect—served to frighten her, for turning round she retreated, followed by her cubs. Some natives then waded through the mud to the Moorman, who was just exhausted, and would have been drowned but that he fell with his head upon a tuft of grass. The poor man was unable to speak, and for several weeks his intellect seemed confused. The adventure sufficed to satisfy him that he could not again depend upon a charm to protect him from Bears, though he always insisted that but for its having fallen from his hair, where he had fastened it under his turban, the Bear would not have ventured to attack him.'"*

THE SPECTACLED BEAR.†

One of the most comical and grotesque of all the Bear family is the Spectacled Bear, which derives its chief attraction from the light-coloured rings round its eyes; these—the greater part of the face being, like the body, black—have exactly the appearance of a pair of common "goggles," through which the beast seems to look with an air of mingled wisdom and imbecility. Hence, of course, we get the animal's English popular name.

The Spectacled Bear occurs only in South America, where it is found in the mountainous regions of Chili. It attains a length of about three feet and a half.

THE POLAR BEAR.‡

The great White Bear of the Arctic regions—the "Nennok" of the Eskimo—is the largest as well as one of the best known of the whole family. It is a gigantic animal, often attaining a length of nearly nine feet, and is proportionally strong and fierce. It is found over the whole of Greenland; but its numbers seem to be on the decrease. It is distinguished from other Bears by its narrow head, its flat forehead in a line with the prolonged muzzle, its short ears, and long neck. "It is of a light creamy colour, rarely pure white, except when young: hence the Scottish whalers call it the 'brounie, or 'brownie,' and sometimes 'the farmer,' from its very agricultural appearance as it stalks leisurely over the furrowed fields of ice. Its principal food consists of Seals, which it persecutes most indefatigably; but it is somewhat omnivorous in its diet, and will often clear an islet of Eider-duck eggs in the course of a few hours. I have seen it watch a Seal for half a day, the Seal continually escaping, just as the Bear was about putting its foot on it, at the *atluk* (or escape hole) in the ice. Finally, it tried to circumvent its prey in another manner. It swam off to a distance, and when the Seal was again half asleep at its *atluk*, the Bear swam under the ice, with a view to cut off its retreat. It failed, however, and the Seal finally escaped. The rage of the animal was boundless; it roared hideously, tossing the snow in the air, and trotted off in a most indignant state of mind."§

Being so fond of Seal-flesh, the Polar Bear often proves a great nuisance to Seal-hunters, whose occupation he naturally regards as a thoughtful catering for his wants. He is also glad of the Whale carcases often found floating in the Arctic seas; and travellers have seen as many as twenty Bears busily discussing the huge body of a dead Whalebone Whale.

As the Polar Bear is able to obtain food all through the Arctic winter, there is not the same necessity, as in the case of the vegetable-eating Bears, for hibernating. In fact, the males and young females roam about through the whole winter, and only the pregnant females retire for the season. These—according to the Eskimo account, quoted by Captain Lyon—are very fat at the commencement of winter, and on the first fall of snow they lie down and allow themselves to be covered, or else dig a cave in a drift, and then go to sleep until the spring, when the cubs are born. By this time the animal's heat has melted the snow for a considerable distance, so that there is plenty of room for the young ones, who tumble about at their ease, and get fat at the expense of their parent, who, after her long abstinence, becomes gradually very thin and weak. The whole family leave their abode of snow when the sun is strong enough to partially

* Tennent: "Ceylon."

† *Ursus* (or *Helarctos*) *ornatus*.

‡ *Ursus* (or *Thalassarctos*) *maritimus*.

§ R. Brown, quoted from "Arctic Manual."

melt its roof. The Eskimo have the same theory about the hibernating Polar Bears that the Northern Indians hold with regard to the Brown Bear, namely, that it has no evacuations during the winter, "stopping up all the natural passages with moss, grass, or earth."

The Polar Bear is regularly hunted with Dogs by the Eskimo. The following extract gives an account of their mode of procedure:—"Let us suppose a Bear scented out at the base of an iceberg. The Eskimo examines the track with sagacious care, to determine its age and direction and the speed with which the animal was moving when he passed along. The Dogs are set upon the trail, and the hunter courses over the ice at their side in silence. As he turns the angle of the berg his game is in view before him, stalking, probably, along with quiet march, sometimes

POLAR BEARS.

snuffing the air suspiciously, but making, nevertheless, for a nest of broken hummocks. The Dogs spring forward, opening a wild, wolfish yell, the driver shrieking 'Nannook! nannook!' and all straining every nerve in pursuit.

"The Bear rises on his haunches, inspects his pursuers, and starts off at full speed. The hunter, as he runs, leaning over his sledge, seizes the traces of a couple of his Dogs, and liberates them from their burthen. It is the work of a minute, for the motion is not checked, and the remaining Dogs rush on with apparent ease.

"Now, pressed more severely, the Bear makes for an iceberg, and stands at bay, while his two foremost pursuers halt at a short distance and await the arrival of the hunter. At this moment the whole pack are liberated; the hunter grasps his lance, and, tumbling through the snow and ice, prepares for the encounter.

"If there be two hunters, the Bear is killed easily; for one makes a feint of thrusting the spear at the right side, and, as the animal turns with his arms towards the threatened attack, the left is unprotected and receives the death-wound.

"But if there be only one hunter, he does not hesitate. Grasping the lance firmly in his hands, he provokes the animal to pursue him by moving rapidly across its path, and then running as if to escape. But hardly is its long unwieldy body extended for the solicited chase, before, with a rapid jump, the hunter doubles on his track and runs back toward his first position. The Bear is in the act of turning after him again, when the lance is plunged into the left side, below the shoulder. So dexterously has this thrust to be made, that an unpractised hunter has often to leave his spear in the side of his prey and run for his life. But even then, if well aided by the Dogs, a cool skilful man seldom fails to kill his adversary." *

With regard to the value of the skins, Dr. R. Brown informs us that "The Royal Board of Trade in Greenland give the natives about five rigsdaler (11s. 3d.) for a skin. Occasionally, there are a number killed near Cape Farewell, which have come round on the Spitzbergen ice-stream. Here a curious custom prevails, viz., that whoever sights the Bear first—man, woman, or child—is entitled to the skin, and the person who has shot it only to the blubber and flesh."

There are some dreadful tales prevalent as to the ferocity of the Polar Bear; but these, according to the same excellent observer, approach a good deal the nature of "yarns." After having lived for some time in the Arctic regions, and hunted Bears again and again, he considers that "a great deal of the impressions which we have imbibed regarding its ferocity are more due to old notions of *what it ought to be* rather than *what it is*, and that the tales related by Barentz, Edward Pelham, and other old navigators, regarding its bloodthirstiness during the time they wintered in Spitzbergen, were a good deal exaggerated. When enraged, or emboldened by hunger, I can, however, quite well understand that, like all wild and even domesticated animals, it may be dangerous to man. On the East Coast of Greenland, where they know little of man, they are very bold. The members of the German Expedition, when making out-door observations, had to be continually on their guard against them. I have chased it over the floes of Pond's Bay, and the Bear's only thought seemed to be how best to escape from its pursuers. I should have hesitated a good deal before making so free with the Grizzly Bear of the Californian wilds (*Ursus ferox*), which is, perhaps, the most ferocious animal on the American continent. Though seemingly so unwieldy, the *nennok* runs with great speed, and being almost marine in its habits, it swims well. I have chased it with a picked crew of eight whalemen, and yet the Bear has managed to distance us in the race for the ice-fields. It would every now and again, when its two cubs were getting left in the rear, stop and (literally) push them up behind; and on reaching the steep edge of the ice-floe, finding that we were fast reaching them, it lifted each of them upon the ice with its teeth, seizing the loose skin at the back of the neck. Once on the ice, they were safe.

"Unlike its congeners, it does not *hug*, but *bites*; and it will not eat its prey until it is dead, playing with it like a Cat with a Mouse. I have known several men who, while sitting watching or skinning Seals, have had its rough hand laid on their shoulder. Their only chance then has been to feign being dead, and manage to shoot it while the Bear was sitting at a distance watching its intended victim. Though Eskimo are often seen who have been scarred by it, yet I repeat that, unless attacked or rendered fierce by hunger, it rarely attacks man. During our last trip to Greenland, none of our party saw one; indeed, they are only killed in the vicinity of Disco Bay, during the winter or spring, when they have either come or drifted south on the ice-floes. Six were killed in the vicinity of Omenak during the winter of 1866–67."

The flesh of the Polar Bear is sometimes eaten by the Eskimo, but parts of it are said to be poisonous; this is especially the case with the liver. Scoresby relates that sailors who have incautiously partaken of the latter have been made very ill, and have died from its effects; and Kane, who wished to try for himself the truth of the statement, was upset by the first taste. The fat of this Bear is used for burning; it has not the disagreeable smell of train-oil.

* Quoted by Jesse: "History of the British Dog."

CHAPTER XI.

RACOON FAMILY—PANDA FAMILY—WEASEL FAMILY—FOSSIL CARNIVORA.

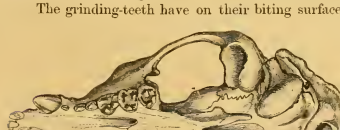
THE RACOON FAMILY—Characters of their Skull, Teeth, &c.—Geographical Distribution—THE RACOON—Its Habit of Washing its Food—Its External Characters and Habits—Racoon Hunting—The Crab-eating Racoon—THE COATI—THE KINKAJOU—Its Lemur-like Appearance, Prehensile Tail, &c.—THE CACOMIXLE—THE PANDA FAMILY—THE PANDA—Its Character and Habits—The Ailuropus—THE WEASEL FAMILY—Anatomical Characters—Tail-glands—Division of the Family into Three Sub-families—Importance of the Mustelidæ as Fur-producing Animals—THE GLUTTON—Its Characters—Superstitions Regarding it—Its Cunning—THE MARTEN—THE PEKAN—THE SABLE—THE WEASEL—THE STOAT, OR ERMINE—The Difference between its Winter and Summer Dress, and the manner in which the Change takes place—THE POLECAT—THE FERRET—THE MINK—THE GRISON—THE TAYRA—THE RATEL—THE COMMON BADGER—Its Habits—Burrowing—THE AMERICAN BADGER—THE TELEDU—THE CAPE ZORILLA—THE COMMON SKUNK—Its Noxious Secretion—Hydrophobia produced by Skunk Bite—The Little Striped Skunk—The White-backed Skunk—THE COMMON OTTER—The Adaptation of its Structure to Aquatic Life—Use of Tame Otters for Fishing—The Canadian Otter—The Margined-tailed Otter—THE SEA OTTER—Its Affinities with the Seals—How it is Hunted—GENERAL RELATIONS OF THE LAND CARNIVORA—FOSSIL CARNIVORA—The Tendency of these to bridge over Existing Groups—Appendix to Chapter VI. (Civet Family)—THE CYNOGALE—THE CYNICTIS—THE MANGUE—THE SURICATE.

THE RACOON FAMILY.*

THIS is a small family of curious Bear-like animals, of small size, and differing a good deal in external appearance, although agreeing closely in all essential particulars. They are plantigrade, like the Bears, and like them are quite devoid of a blind-gut, or cæcum. The skull is long-snouted, and, though presenting certain resemblances to that of the Civets, has still the essential Arctoid characters, such as the well-marked bony ear-passage, and the wide space between the ear-drum bone and the bony projection on the hinder part of the skull (paroccipital process). A great difference from the Bear's skull, is, however, seen in the swollen and bulb-like ear-drum bone (bulla tympani), which is as large as that of a Dog.

SKULL OF RACOON.

The grinding-teeth have on their biting surfaces large and prominent tubercles, so that they are neither altogether of a crushing, nor altogether of a mincing character. The molars bear a considerable resemblance to the hinder molars of the Dog; the canines are compressed from side to side, have very sharp front and back edges, and are somewhat outstanding. The number of the teeth is forty,† that is, two less than in the Bears, the missing teeth being the last upper molar of each side.



HALF OF SKULL OF RACOON, UNDER VIEW.

The four genera of the Racoon family are found only in the New World; their northern limit is British Columbia, while southwards they reach to Paraguay in the central part of South America.

THE RACOON.‡

Every visitor to the Zoological Gardens must have been struck with the curious habits of this animal. If any one gives it a bit of bun or biscuit, the Racoon holds out both its hands for the morsel, and takes it almost as deftly as a Monkey; it then waddles off to the little pond in the middle of its cage, dips its prize in the water, and when it is well soaked, proceeds to devour it. Except in the case of meat, which the Racoon seems to consider moist enough, the food always has to undergo this soaking process before it is thought to be fit to eat. It is from this habit that the

* *Procyonidæ*. † The dental formula is—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{2-2}{2-2} = 40$. ‡ *Procyon lotor*.

Racoon derives its specific name of *lotor*, "the washer," and its German appellation of *Waschbär*, or "washing Bear."

The Racoon is a decidedly handsome animal, about the size of a large and very corpulent Cat. The hair is of a brown or grizzled colour, long and furry, the tail bushy and beautifully ringed. Its body is large and somewhat unwieldy, its legs short, and its feet armed with strong claws, suitable for burrowing or climbing. The head is large, the cheeks prominent and black, and the snout sharp, light-coloured, and somewhat up-turned—"tip-tilted, like the petal of a flower"—giving the animal a curious inquisitive look, which is quite borne out by its character. It investigates every object within reach, animate or inanimate; the latter, if portable, it is fond of carrying off and carefully washing.

In the matter of diet it is omnivorous, and seems almost equally fond of meat, insects, fruit, or bread. It is said also to catch and eat oysters and crabs, and to confine itself, in the case of the birds it catches, to the brain and blood. It is a decidedly cunning animal, and in captivity, when allowed a

RACOON.

certain amount of liberty, shows great talent in stealing fruit and killing fowls. When eating, it very usually sits up on its haunches and holds the food with both fore-paws.

The skin of the Racoon forms a valuable fur, and the animal is, consequently, much sought after throughout the whole of its range, which extends over a considerable portion of North America. It is usually caught in traps, but is also hunted by Dogs. The hunt takes place at night, by the light of torches. The Racoon is pursued until he takes refuge up a tree, when the Dogs form a circle round the trunk, and an experienced climber swarms up to the animal's refuge, pursues him to the end of a branch, and then, by shaking the branch, makes him fall to the ground, when the Dogs have another turn. So active is the Racoon, and so dangerous when roused, that this operation often has to be repeated two or three times before he is finally caught.

The Crab-eating Racoon (*Procyon cancrivorus*) is a South American species, differing from the foregoing chiefly in the shortness of its fur, and its consequently slender shape. It is a far less handsome animal than its North American relative, which it resembles very closely both in structure and in habits.

THE COATI.*

The Coati is an animal of far less attractive appearance than the Racoon. The body is proportionally longer, the limbs are short, and the snout of a remarkable length and very pig-like: in fact, the head

* *Nasua narica.*

of a Coati reminds one strongly of that of a small dark-coloured Pig pulled out until the muzzle was two or three times its ordinary length. The snout is, moreover, very flexible, and the animal perpetually turns it about in various directions in a highly inquisitive way. The body is somewhat over half a yard in length, the tail a little shorter.

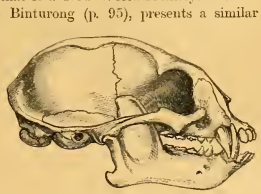
The fur is short and of a reddish or greyish-brown colour, the muzzle and feet are black, the tail

COATI.

ringed with black and brownish-yellow. Like the Racoon, it feeds upon fruit, insects, small birds, &c., and, like it, is a good climber. The specimens in the Zoological Gardens are in a constant state of activity, trotting about from one end of the cage to another, climbing over the tree trunk placed in their prison, and turning their queer-looking snouts about ceaselessly. The geographical range of the Coati extends from Mexico in the north to Paraguay in the south.

THE KINKAJOU.*

Looking merely at the exterior of this animal, one would almost feel inclined to place it, as some of the earlier naturalists did, among the Lemurs: for, like them, it has a prehensile tail, one which can be coiled around branches to help its progress, precisely like that of a New World Monkey. It will be remembered that one member of the Civet family, the Binturong (p. 95), presents a similar peculiarity. But the Binturong's tail is a comparatively imperfect organ, merely prehensile at the tip, while that of the Kinkajou can be readily coiled two or three times round a branch. We thus see that the same remarkable adaptation to arboreal life which is found in the whole group of New World Monkeys appears in one species from each of two distinct families of Carnivores, one of which is confined to the Old World, while the other exists only in the New World. And we shall see the same character crop up once more, when we come to the group of pouched animals (Marsupials), in the American Opossums. It must, of course, be clearly understood that the possession of a prehensile tail is no sign whatever of any relationship between the animals possessing it. It may be taken as certain that it was produced quite separately in all the four cases we have mentioned in relation to the habits of the animal.



SKULL OF KINKAJOU.

The Kinkajou uses its paws in a wonderfully hand-like manner, and employs both fore and hind feet to bring food to its mouth. It will also hold a piece of bread in one hand, and break off pieces from it with the other, and this in spite of the fact that it has no opposable thumb, and that its fingers are

* *Cercoleptes caudivolvulus.*

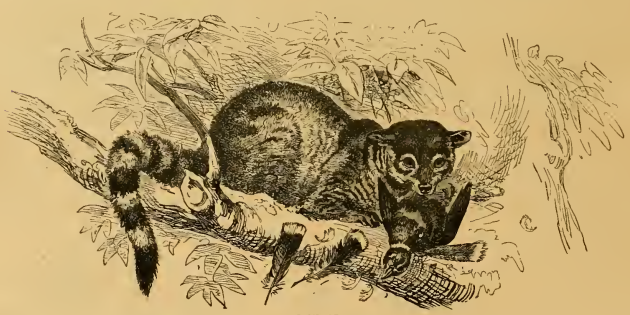
short and webbed nearly to the claws. For the rest, it is a pretty, innocent-looking little animal, with a body about a foot long, and a tail of some eighteen inches, covered with soft brown fur, and walking on the soles of its fore feet, while in the hind feet the heel is well raised from the ground. The skull is remarkable for its rounded form, and for the shortness of its facial portion: on a superficial examination it looks almost Cat-like. It feeds upon fruit, eggs, insects, birds, &c. It is found in Mexico, Guatemala, and in the great forests of Peru and North Brazil.

THE CACOMIXLE.*

The Cacomixle, Civet, or ring-tailed Cat, as it is indifferently called by the miners of the districts where it is found, is a puzzling little creature, which was, until quite recently, placed in the Civet family, and, in consequence, was looked upon as one of the chief difficulties in the way of explaining satisfactorily the present geographical distribution of animals, for all the other *Viverridæ* are Old World forms. Its true place has, however, at last been assigned to it, and the anomaly is at an end: for, like all other members of the Racoon family, it is confined to America, where it occurs in California, Texas, and the higher regions of Mexico.

SKULL OF CACOMIXLE.

The Cacomixle is about a yard long, two-fifths of this length being taken up by the tail. Its fur is brown, and its tail beautifully ringed. Its habits are entirely arboreal, and it makes a moss-lined nest in hollow trees. It has a curious habit of gnawing the wood round the entrance of the hole, so that hunters are able to tell whether a hollow tree is



CACOMIXLE.

inhabited or not, by the presence or absence of *débris* of bark and wood at the root. It frequently trespasses into the miner's tent "and plunders his provision bag. When caught, as it often is, it becomes so familiar and amusing, and does so much to relieve the monotony of the miner's life, that it is highly valued, and commands quite a large price." It is said to be a capital mouser.

THE PANDA FAMILY.†

This group, which has received a most unfortunate name, as it belongs to the *Arctoidea* and not to the *Æluroidea*, contains only two genera, one of which has been recently discovered, while the other has been known for many years.

* *Bassaris astuta.* † *Ai'uridæ.*

THE PANDA*

Forms a striking object among the small Mammals. It is a really beautiful creature, rich red chestnut in colour on the upper surface, jet black as to the lower surface, the limbs also black, the snout and the inside of the ears white, the tail bushy, reddish-brown in colour, and indistinctly ringed. The fact of the under surface being black while the upper is bright reddish-yellow is remarkable; with most animals, when there is any difference in colour, it is the under surface which is lighter. The body and head are about half a yard long, the tail about a foot. The mode of progression is plantigrade, and the large curved claws are half retractile. The main anatomical characters are decidedly ursine, as also are the habits. Mr. Bartlett, who studied the

PANDA. (From the *Proceedings of the Zoological Society.*)

Panda that found a home for a time at the Zoo, states that, when drinking, it sucked up the fluid like a Bear, instead of licking it up as a Dog or Cat would do. When offended it would rush at Mr. Bartlett, and strike at him with both feet, the body being raised like a Bear's and the claws projecting. It also, when angry, made a sharp spitting noise; at other times it used a "weak, squeaking call-note." On level ground it ran in the same manner as the Weasel, Otter, and Kinkajou, with a sort of jumping gallop, the back being kept much arched.

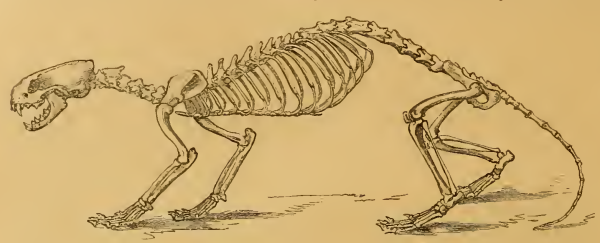
The Panda is found in the forests of the Eastern Himalayas, as well as in Eastern Tibet. It is sometimes known as the Wah, or as the Red Bear-Cat.

The only remaining member of this family has been discovered within the last few years in the mountains of East Tibet, by the Abbé David, and has been called by M. Alphonse Milne-Edwards *Ailuropus*. It is a large animal, nearly white, and very Bear-like in external appearance, although the structure of the skull and teeth shows clearly that its nearest allies are the Panda and the Racoon.

* *Ailurus fulgens.*

THE WEASEL FAMILY.*

This family, including the Weasels, Martens, Skunks, Gluttons, Otters, Badgers, &c., is the most heterogeneous assemblage of all the Carnivorous group. Its members have a very wide geographical distribution, being found in all parts of the world, except the West Indies, Madagascar, and the Australian region. They differ very much among themselves, but have, nevertheless, certain important characters in common, such as the structure of the ear-drum bone, which in essential respects resembles that of the Bears, as also do the organs of digestion. They all possess, beneath the



SKELETON OF WEASEL.

root of the tail, anal glands, organs of similar nature to the civet-producing glands of the Viverridæ, but secreting a more or less noxious fluid. The number of animals in this family is very great, and it will be impossible to treat of any but the principal species. As a matter of convenience, the members of the group are often split up into sections, one (the true *Mustelidæ*) containing the Gluttons, Martens, Weasels, Ferrets, and Grisons; another (the *Melidæ*) consisting of the Badgers, Ratels, and Skunks; and a third (the *Lutridæ*) containing the Otters.

Many of these animals are looked upon as "vermin," but among them are some of the most valuable of the fur-producing animals: the Ermine, Sable, Mink, and Marten. These are all inhabitants of the Northern hemisphere, and the business of trapping them is a very important branch of industry, as may be gathered from the fact, quoted by Dr. Elliott Coues,† that "during the century 1769—1868, the Hudson's Bay Company sold at auction in London, besides *many millions* other pelts (skins), the following of *Mustelidæ*:—1,240,511 Sables; 674,027 Otters; 68,694 Wolverenes; 1,507,240 Minks; 218,653 Skunks; 275,302 Badgers; 5,349 Sea-Otters. In 1868 alone, the Company sold (among many thousand others), 106,254 Sables; 73,473 Minks; 14,966 Otters; 6,298 Skunks; 1,104 Wolverenes; 1,551 Badgers; 123 Sea-Otters; besides which were also sold in London, in the autumn of the same year, about 4,500 Sables; 22,000 Otters, &c."

THE GLUTTON.‡

The Glutton, or Wolverene, the largest of the Weasel group, is found over the greater part of the northern regions, both of the Old and New Worlds, being especially abundant in Siberia and Kamtchatka. It attains a length of some three feet four inches, ten inches of which go to the tail. It has a Dog-like snout, a broad or rounded head, short ears, an arched back, a short bushy tail, and long, dark brown or almost black fur. A band of pale reddish-brown runs along the sides, and unites with the corresponding band of the opposite side on the rump.

The skull is very strong and massive, and the jaws bear altogether thirty-eight teeth. The number of the incisors, canines, and premolars corresponds with that we have found in the Arctoids; but the molars are reduced to one on each side in the upper, and two on each side in the lower jaw.§

* *Mustelidæ.* † "Fur-bearing Animals: a Monograph of North American Mustelidæ" ‡ *Gulo luscus.*

§ The dental formula is—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{1-1}{2-2} = 38$.

The mode of progression is semi-plantigrade, and the animal's movements are, compared with those of its nearest allies, the Martens and Weasels, slow and clumsy; unlike these, too, it is not a good climber, although the older accounts of its customs stated that it was in the habit of climbing trees, and dropping suddenly down upon large animals as they passed, and then destroying them as they fled in terror at the unexpected attack. In this, as in many other instances, the imagination has largely been called into play to supplement what was deficient in the actual observations of the writers. Probably few animals have given rise to so many or such wild fables as the Wolverene. Its name of

GLUTTON.

Glutton is due to the mythical account of its habits given by an early writer, Olaus Magnus, who says: "It is wont, when it has found the carcass of some large beast, to eat until its belly is distended like a drum, when it rids itself of its load by squeezing its body betwixt two trees growing near together, and again returning to its repast, soon requires to have recourse to the same means of relief." It need hardly be said that this story must be taken *cum grano salis maximo*.

Besides its great strength, the Wolverene is noted for its excessive cunning, and the two qualities combined give it a power of destructiveness of which one would hardly expect any animal below a schoolboy to be capable. One of its favourite tricks is to frequent the "Marten-roads"—that is, the lines of traps for catching Martens—and one by one to demolish the traps, and carry off either the bait or the imprisoned animal. To make matters worse for the unlucky trapper, the Glutton's experience and knowledge of traps in general are so great that he shows equal skill in avoiding these

set for his own benefit as in despoiling those meant for others; either he takes no notice of them, or carefully pulls them to pieces, and so gets the bait and outwits the hunter, without danger to himself. It is only in a trap constructed with the greatest care, and disguised so as to resemble a "cache," or store of hidden food, that the wary beast can be caught. Mr. Lockhart, an American writer, quoted by Dr. Coues, gives some really charming instances of his own experience in trying to get the better of his inveterate enemy. In one case, he had carefully buried a Lynx's skin in the snow, to the depth of some three feet; the snow was arranged so as to present a perfectly undisturbed appearance, and the Lynx's entrails and blood were strewed about, and its carcass left, so as to take off the scent. On returning next morning to his beautifully-made "cache," he found the carcass, &c., gone, but everything else apparently just as he had left it. His joy was great, but premature; for on digging, no skin was to be found: the Wolverene had stolen it during the night, but had added insult to injury by filling up the hole, and putting everything *in statu quo*.

Mr. Lockhart gives another equally astonishing instance of the Wolverene's ability:—"At Peel's River, on one occasion, a very old Carcajou [the trapper's name for the Glutton] discovered my Marten-road, on which I had nearly a hundred and fifty traps. I was in the habit of visiting the line about once a fortnight; but the beast fell into the way of coming oftener than I did, to my great annoyance and vexation. I determined to put a stop to his thieving and his life together, cost what it might. So I made six strong traps at as many different points, and also set three steel traps. For three weeks I tried my best to catch the beast, without success; and my worst enemy would allow that I am no green hand in these matters. The animal carefully avoided the traps set for his own benefit, and seemed to take more delight than ever in demolishing my Marten-traps, and eating the Martens, scattering the poles in every direction, and caching what baits or Martens he did not devour on the spot. As we had no poison in those days, I next set a gun on the bank of a little lake. The gun was concealed in some low bushes, but the bait was so placed that the Carcajou must see it on his way up the bank. I blockaded my path to the gun with a small pine-tree, which completely hid it. On my first visit afterwards, I found that the beast had gone up to the bait and smelled it, but had left it untouched. He had next pulled up the pine-tree that blocked the path, and gone around the gun and cut the line which connected the bait with the trigger just behind the muzzle. Then he had gone back and pulled the bait away, and carried it out on the lake, where he laid down and devoured it at his leisure. There I found my string. I could scarcely believe that all this had been done designedly, for it seemed that faculties fully on a par with human reason would be required for such an exploit, if done intentionally. I therefore re-arranged things, tying the string where it had been bitten. But the result was exactly the same for three successive occasions, as I could plainly see by the footprints; and what is most singular of all, each time the brute was careful to cut the line a little back of where it had been tied before, as if actually reasoning with himself that even the knots might be some new device of mine, and therefore a source of hidden danger he would prudently avoid. I came to the conclusion that *that* Carcajou ought to live, as he must be something at least human, if not worse. I gave it up, and abandoned the road for a period."

One very extraordinary habit of the Wolverene is shared by very few animals except man. It is stated by Dr. Coues that, when it meets a man, it will often, if it be to windward, approach within fifty or sixty yards, and then, sitting calmly down on its haunches, will shade its eyes with one fore-paw, and gaze earnestly at its enemy. This very human action it will often repeat two or three times before attempting to flee.

THE MARTEN.*

The Pine Marten is perhaps the most pleasing of the Weasel group, as far as appearance is concerned. Its long, lithe body attains a length of over half a yard; its tail is about a foot in length. The legs are short, though not nearly so short as in the Weasels, and its paws have five digits, armed with sharp claws. The snout is sharp and beset at the sides with long vibrisse. The skin is very beautiful, dark-brown for the most part, lighter on the cheeks and snout, and on the throat and under side of the neck a light yellow.

* *Mustela martes.*

The skull is much more elongated than either a Bear's or a Glutton's; the tympanic bullæ are slightly swollen, and the jugal arches, beneath which the jaw muscles pass, are comparatively narrow and slender. As in the Wolverene, there are thirty-eight teeth, eighteen in the upper, twenty in the lower jaw, and the molars are thoroughly carnivorous in character, being produced into sharp, trenchant, cutting edges.

The Pine Marten occurs over a considerable portion of Europe and Asia, and, amongst other places, in Great Britain, where, however, it is becoming rare. The finest specimens are said to come from Sweden.

This animal is essentially arboreal in its habits, inhabiting chiefly thick coniferous woods, whence its name of Pine Marten is derived. In the branches the female makes a nest of leaves or moss, and sometimes saves herself this trouble by ejecting Squirrels or Woodpeckers, and occupying the vacant dwellings. For its size it is, like all the *Mustelidæ*, extremely ferocious and strong. It attacks and kills Fawns, notwithstanding their superior size; from these down to mice, nothing comes amiss to it, and nothing is safe from its attacks.

The Beech Marten, or Stone Marten (*Mustela foina*), differs from the foregoing species in certain characters of the skull and teeth, as well as in the fact that the throat is white instead of yellow. Its habits are, on the whole, similar to those of the Pine Marten, but it is more often found away from woods, on the sides of mountains and rocks, or in the neighbourhood of farms. Its general distribution is the same as that of the Pine Marten, but it is decidedly more common than the latter in Great Britain.

THE PEKAN.*

The Pekan, or Pennant's Marten, is a North American species. It is much larger than either of the preceding, the body attaining a length of thirty inches from snout to root of tail, while the tail itself is about sixteen inches long. The face is more Dog-like than that of the Common Marten; the skin is brown, becoming lighter in the front part of the back, and presenting white patches on the chest and belly.

Like the Pine Marten, it is a good climber, but, unlike it, shows a partiality, not for the driest parts of the wood, but for the neighbourhood of water. Its chief food seems to be Mice, but it is also fond of stealing the fish used to bait traps—whence it is often called the Fisher—and Sir J. Richardson states that its favourite meal is the Canadian Porcupine, which it kills by a bite on its unprotected belly, and eats, notwithstanding the quills. Sometimes it is forced, by want of better food, to eat beech-nuts.

THE SABLE.†

This is another species of the same genus, important from the fact that it is the most valuable of the fur-producing animals. Its skin seems to have been even more precious in former times than now. A writer in the sixteenth century states that "forty of the best quality, which is the quantity usually packed in one bale, have been sold for more than a thousand pieces of gold."

The Sable is found in the northern parts of Asia, being especially abundant between the Lena and Kamstchatka. It differs markedly from the true Martens in the form of its head, which is conical, the apex of the cone being formed by the pointed snout, while from its base project the pointed, and, for a *Mustela*, large ears. The legs and feet, too, are larger and stronger than in the other species of this genus.

Sable-hunting is, naturally, a very important branch of industry, and forms the chief occupation of many of the Siberian tribes. The work is by no means an easy one; it entails miles of travelling in dark woods and through heavy snow-storms; the track of the Sables may have to be followed for long distances: and numerous traps must be skilfully set and visited daily. With all his trouble, the hunter often finds that "an Arctic Fox, or some other Carnivore, has eaten up the costly booty, leaving only a few fragments, as if for the express purpose of showing him how narrowly he has escaped earning forty, fifty, or sixty silver roubles."

* *Mustela Pennantii.* † *Mustela zibellina.*

The American Sable (*Mustela americana*), often called the Marten, is a closely allied species. It attains a length of eighteen inches, not including the tail, which measures about a foot more. Its capture gives the American trapper his staple occupation. It "is ordinarily captured in wooden traps of very simple construction made on the spot. The traps are a little enclosure of stakes or brush, in which the bait is placed upon a trigger, with a short upright stick, supporting a log of wood. The animal is shut off from the bait in any but the desired direction, and the log falls upon its victim with the slightest disturbance. A line of such traps, several to the mile, often extends many miles. The bait is any kind of meat, squirrel, piece of flesh, or bird's head. One of the greatest obstacles that the Sable-hunter has to contend with in many localities is the persistent destruction of his traps by the Wolverene and Pekan. . . . I have accounts from Hudson's Bay trappers of a Sable road fifty

SABLE.

miles long, containing 150 traps, every one of which was destroyed through the whole line twice—once by a Wolf, once by a Wolverene. When thirty miles of the same road were given up, the remaining forty traps were broken five or six times in succession by the latter animal."*

THE COMMON WEASEL.†

The Weasel, like the remaining members of the genus *Putorius*, are very often called "vermiform," and a better name could scarcely be applied to them, for anything more worm-like could hardly be imagined in a hairy quadruped. The legs are extremely short in relation to the body, which is attenuated in the highest dégree, and almost regularly cylindrical from one end to the other. Then the neck is of most disproportionate length, and carries the head out so far, that the fore legs appear as

* Coues.

† *Putorius vulgaris.* The Weasel is very commonly referred to the genus *Mustela*, but this name properly belongs to the Martens.

COMMON WEASEL.

if placed quite at the hinder end of the chest, instead of in the front of it. The head passes almost insensibly into the neck, and the neck into the body. The head is flattened, and bears little glittering savage-looking eyes, and small rounded ears. The length from snout to root of tail does not exceed eight inches. The tail is about two inches long. The fur is light reddish-brown above, and white below; in northern latitudes the brown parts assume a much lighter colour in winter, so that the Weasel undergoes a change of coat similar to, but less extensive than, that undergone by the Ermine.

The Weasel is a good climber, and makes use of its skill in this accomplishment to prey upon birds, their eggs, and young. Rats and Mice are, perhaps, its staple food. Of these it makes great havoc, and is therefore a useful hanger-on to the farm-yard, notwithstanding its occasional depredations in the hen-roost. When it catches a Mouse or Rat, it gives it one bite on the back of the head, piercing the most vulnerable part of the brain, and killing instantly. Professor Thomas Bell says:—"I have observed that when a Weasel seizes a small animal, at the instant that the fatal bite is inflicted, it throws its long, lithe body over its prey, so as to secure it should the first bite fail, an accident, however, which I have never observed when a Mouse has been the victim. The power which the Weasel has of bending the head at right angles with the long and flexible, though powerful neck, gives it a great advantage in this mode of seizing and killing its smaller prey." The first part eaten is usually the brain. The stories of the Weasel's blood-sucking propensities are probably false, or at any rate grossly exaggerated.

The Weasel will pursue its prey over fields, in trees, in subterranean burrows, or across water. Like many of the wild Cats, it kills far more than is necessary for its support, and in pursuance of its favourite occupation of slaughter shows an unequalled courage and pertinacity. Its power of keeping its presence of mind under very trying circumstances is well shown in the following anecdote related by Bell:—A gentleman, "while riding over his grounds, saw at a short distance from him a Kite pounce on some object on the ground, and rise with it in his talons. In a few moments, however, the Kite began to show signs of great uneasiness, rising rapidly in the air, or as quickly falling, and wheeling irregularly round, whilst it was evidently endeavouring to force some obnoxious thing from it with its feet. After a sharp but short contest, the Kite fell suddenly to the earth, not far from where Mr. Pindar was intently watching the manœuvre. He instantly rode up to the spot, when a Weasel ran away from the Kite, apparently unhurt, leaving the bird dead, with a hole eaten through the skin under the wing, and the large blood-vessels of the part cut through."

THE ERMINE.*

The Stoat, or Ermine, is an important species closely allied to the Weasel, from which it differs chiefly by its greater size, and by the peculiarities of its colouring. In summer the upper parts vary from yellowish-brown to mahogany brown, while the under side is white tinged with sulphur-yellow, except on the throat, which is pure white. The tail is tipped with black. The brown upper and white under surfaces are separated by a perfectly distinct line of demarcation, which extends from the snout to the root of the tail, dipping down at the limbs, so as to include the outer surfaces of the latter in the dark area. In winter, on the other hand, the skin is, with the exception of the tip of the tail, which always remains black, pure white, tinged here and there with sulphur-yellow. Intermediate states between full winter dress and full summer dress are often found, and these, curiously enough, show their half-way character in two ways. Sometimes there is an alteration in level of the line of demarcation between the white and brown portions of the skin, the latter being occasionally found restricted to a narrow strip along the back, but remaining still without any admixture of white hairs. In other cases, again, the line of demarcation remains unaltered, but the dark portions become gradually lighter and lighter, until the final white dress is assumed.

As to the interesting question of the exact manner and cause of this change, it is sometimes stated that the direct influence of cold produces a rapid lightening in the colour of individual hairs, while there are also facts to show that the change is not due to an alteration in colour of existing hairs, but to a renewal of the coat, the hairs of one colour being replaced by those of the other. Dr. Elliott Coues, who has worked up the subject in an able and exhaustive manner, has satisfied himself that the

* *Putorius erminea.*

change may take place in either way. Some of his specimens, "notably those taken in spring, show the long woolly white coat of winter in most places, and in others present patches—generally a streak along the back—of shorter, coarser, thinner hair, evidently of the new spring coat, wholly dark-brown. Other specimens, notably autumnal ones, demonstrate the turning to white of existing hairs, these being white at the roots for a varying distance, and tipped with brown. These are simple facts not open to question. We may safely conclude that if the requisite temperature be experienced at the periods of renewal of the coat, the new hairs will come out of the opposite colour; if not, they will appear of the same colour, and afterwards change; that is, the change may or may not be coincident with shedding. That it ordinarily is not so coincident seems shown by the greater number of specimens in which we observe white hairs brown-tipped. As Mr. Bell contends, temperature is the immediate controlling agent. This is amply proven in the fact that the northern animals always change; that in those from intermediate latitudes the change is incomplete, while those from farther south do not change at all." The advantage of the change to the animal is manifest; its colour becomes that of the snow over which

WEASEL (1) AND ERMINE (2) IN THEIR WINTER CLOTHING.

it travels in pursuit of game, so that it is less easily seen and avoided. Unfortunately for it, however, a similar "protective colouring" is adopted by some of its victims.

The habits of the Stoat resemble those of the Weasel; it is dangerous both to the sheep-fold and to the poultry-yard, but partly atones for its poaching by the immense number of Rats and Mice it is capable of destroying. Audubon relates that he "once placed a half-domesticated Ermine in an out-house infested with Rats, shutting up the holes on the outside to prevent their escape. The little animal soon commenced its work of destruction. The squeaking of the Rats was heard throughout the day. In the evening it came out, licking its mouth, and seemed like a hound after a long chase, much fatigued. A board of the floor was raised to enable us to ascertain the result of our experiment, and an immense number of Rats were observed, which, although they had been killed in different parts of the building, had been dragged together, forming a compact heap."

Both Weasel and Ermine are found over the greater part of Northern Europe, Asia, and America.

THE POLECAT.*

In form this animal does not differ very markedly from the Marten, except for the fact that its head is broader, its snout blunter, and its tail very much shorter: the latter being about five and a

* *Putorius fœtidus.*

half inches, while the head and body together are nearly a foot and a half long. The neck is considerably shorter, and the body stouter than in the Weasel and Stoat. The fur is made up of hairs of two kinds, the shorter woolly and of a yellowish colour, the longer black or brownish-black and shining. One of its most marked characters is its horrible stench. This is produced, like the scent of the Civets, in a pair of glands near the root of the tail, which secrete a yellowish creamy substance of the most fetid character.

SKULL OF POLECAT. (*After Cuvier.*)

The Polecat is also known as the Fitchet (Fitchew of Shakspere), Foumart, or Foulimart: the latter names are said to be a contraction of "Foul Marten," thus distinguishing it from the Common or Sweet Marten, which is a comparatively inodorous animal. The name Polecat is probably a contraction of Polish Cat.

The Polecat is perhaps even more destructive than the other Mustelidæ, and is certainly a far greater plague to the farmer. Its ravage among Rabbits, Hares, and Partridges is immense, and if once it

1. POLECAT. 2. FERRET.

gets unobserved into a poultry-yard, the fate of a very considerable number of the inmates is sealed, as it possesses in a high degree the family love of slaughter for slaughter's sake. It has been known to kill as many as sixteen Turkeys in a single night; and, indeed, it seems a point of honour with this bloodthirsty little creature to kill everything it can overpower, and to leave no survivors on its battle-fields. It has, too, an unfortunate liking for eggs, as well as for game and poultry, and in this way alone does great harm to preserves. There are also many accounts of its fondness of fish; Bell also quotes an instance in which a female Polecat was pursued to her nest, and was found to have laid up, in a side hole, a store of food, consisting of forty Frogs and two Toads, all of which she had skilfully "pithed," that is, bitten through the brain, so that, although retaining a certain amount of vitality, they were effectually prevented from running away!

The Polecat is found throughout Northern Europe, not extending southwards into the warmer parts of the Continent, but being quite at home in snow-covered regions. It is essentially, like the Marten, a sub-arctic and temperate animal.

THE FERRET.*

This is a domesticated variety of the genus *Putorius*, of African origin. It shows its Southern nature by being, unlike the Polecat, unable to endure great cold; even an English winter is enough to kill it if not properly housed. It is an interesting animal, zoologically, from the fact that it is a true-breeding Albino, having the white fur and pink eyes of that peculiar "sport." It is a little smaller than the Polecat, with which it will breed with perfect readiness, producing hybrids intermediate in character between the two parent species.

Ferrets are much used, both in Britain and America, chiefly for killing Rats and for driving Rabbits out of their burrows. For the latter function the Ferret is muzzled, to prevent its killing the Rabbit in the burrow; the latter is either netted or killed immediately, as soon as it is driven out. The Ferret is also frequently employed to kill fowls for the table. Its particularly neat method of slaughtering by one bite in the neck is much admired by Ferret-fanciers, who make quite a pet of the animal. It, however, never shows the slightest affection for its master, and has usually to be confined: the necessity of this is shown in an instance, quoted by Bell, in which a child was attacked in its cradle, and only rescued after the veins of its neck had been severed, its face, neck, and arms lacerated, and its eyes so injured that the sight of one of them was permanently lost.

THE MINK.†

This important fur-producing animal is found in the northern parts of both hemispheres under various specific forms, the most important of which are the European Mink (*P. lutreola*) and the American Mink (*P. vison*). Although most nearly allied to the Stoats and Weasels, it shows a certain resemblance to the Martens in its larger and stouter body, which attains a length of from fifteen to eighteen inches, the tail being about seven or eight inches long, and bushy at the tip. Like most of its allies, it has two kinds of fur—"a soft matted under fur, mixed with long, stiff, lustrous hairs." The colour varies from dull yellowish-brown to dark chocolate-brown; the upper lip is usually white in the European, dark in the American species. The scent-glands are well developed, and their secretion is second only in offensiveness to that of the Skunk.

The habits of the Mink differ altogether from those of the other species of the genus. As Dr. Coues observes, "It is to the water what the other Weasels are to the land, or the Martens to the trees. It is as essentially aquatic in its habits as the Otter, Beaver, or Musk Rat, and spends, perhaps, more of its time in the water than it does on land. In adaptation to this mode of life, the pelage has that peculiar glossiness of the longer bristly hairs and felting of the close under fur which best resists the water." It feeds chiefly upon aquatic or amphibious animals, such as fish, frogs, crayfish, molluscs, and the like, but also preys largely upon the smaller Mammals. It is stated that it is not an indiscriminate slaughterer, but kills only what is necessary for its actual wants.

In America the Mink has been regularly domesticated and trained as a Rat-catcher, like the Ferret. "Minkeries" have been established in connection with farm-yards, and have proved in more than one instance eminently successful. The animals soon allow themselves to be handled, and besides becoming good Ratters, bring their owner a very considerable profit by their fur, for which alone it is well worth while to breed them, as the expense of keeping them is trifling.

THE GRISON.‡

This is a Weasel-like animal, found only in South America, and distinguished from its nearest relations, the Martens and Weasels, by the fact that the colour of the upper is lighter than that of the lower surface of its body, the former being grey, the latter dark brown. Its whole length is rather

* *Putorius furo.* † *Putorius lutreola* and *P. vison.* ‡ *Galictes vittata.*

under a yard; of this not more than a third is taken up by the tail. It is found in plantations and in the neighbourhood of buildings, and makes its abode in hollow trees, clefts in rocks, and holes in the earth.

As to its disposition, some notion may be gained from a tale told by Bell of a tame specimen in his possession. He says that it "was very fond of Frogs, but these were not the only animals which were obnoxious to its voracity. On one occasion, in the winter, I had placed it in its cage, in a room with a fire, where I had also two young Alligators, which in general were stupidly tame. On going into the room in the morning, I found the Grison at large, and one of the Alligators dead, with a hole eaten under the fore-leg, where the great nerves and blood-vessels were torn through; and the other Alligator began snapping furiously at every one who attempted to approach it."

GRISON.

THE TAYRA.*

This animal may be considered without exaggeration to be one of the ugliest in the whole Carnivorous order. It is not unlike the Marten in shape, but of a dark brown colour, and with a low, villainous, and almost debauched expression of face. The head and body together attain a length of rather more, the tail of rather less, than half a yard. The colour of the pelage is dark blackish-brown, becoming lighter on the head and neck, on the under surface of which there is a yellowish spot. It is found, like the Grison, in South America, where it extends from Brazil and British Guiana in the north to Paraguay in the south.

It lives in forests, preying upon small mammals and birds, and does its hunting chiefly in the morning, starting for work at sunrise, and returning about midday.

THE RATEL.†

This animal, sometimes known as the Honey Badger, is one of the exceptional animals whose colour is lighter above than below. Its stiff, wiry hair is ashy-grey on the upper surface, while on the under surface, the muzzle, limbs, and tail are black. The line of demarcation between the grey and black is so sharp, that the animal has the appearance of being really black, but covered, as to its back, with a grey cloak. It is about three-quarters of a yard long, the tail taking up about a sixth of the length. In the matter of teeth it is interesting, as its molars are reduced to one on each side in each jaw: a reduction equal to that found in the Cats.

It is said to live largely on Bees, and to show a great amount of skill in tracking to their nest

* *Galictes barbara.* † *Mellivora capensis* and *M. indica.*

the insects which it observes on the wing. Sparrmann states that it seats itself on a hillock to look out for the Bees, and shades its eyes with one fore-paw against the rays of the setting sun.

It is a stupid animal, very sleepy during the day, and issuing from its burrows at sunset to seek for the birds, tortoises, insects, and worms on which it feeds. It is very tenacious of life, and is

RATEL.

well protected from attacks by the thickness and looseness of its skin, and the thick subcutaneous layer of fat. It also possesses an additional means, if not of defence, at least of offence, in its tail glands, the secretion of which is very strong and pungent as to its odour. It is still further advantaged by its burrowing powers; it will scratch up a hole, and disappear into it in an incredibly short space of time.

The Ratels in the Zoological Gardens in Regent's Park (where the habits of all the animals will repay the study of the most casual observer) exhibit a remarkable peculiarity. We have very frequently watched one of them run round and round his cage in the usual purposeless

manner of captive animals, but with this peculiarity: when he reached a particular corner of the den, he quietly, and without effort, turned over head and heels, and then went on again. On one occasion, after he had been doing this with great regularity for some rounds, he seemed to become abstracted, and passed the usual spot without the somersault. When, however, he had proceeded a few paces, he recollected himself, stopped for a moment, returned to the exact place, turned over as usual, and proceeded without further let or hindrance.

There are two species of Ratel, one, the Cape Ratel (*Mellivora capensis*), occurs in South Africa, the other, or Indian Ratel (*M. indica*), being found in India.

THE COMMON BADGER.*

The Badger is the largest of the indigenous Carnivora of Great Britain; for although the length of its body is not quite equal to that of the Fox, in bulk it far exceeds the slender and active Reynard. It is, indeed, a heavy and somewhat clumsy animal, long and stout-bodied, and short-legged, with a tapering and mobile snout, and a short scrubby tail. The long hair is of three colours: black, white, and reddish, the mingling of the three producing a varying grey hue. The head is white, except for a black band on each side, which commences a little behind the nose, and extends backwards, including the eye and ear, the tip of the latter being, however, white. The lower parts of the body and the legs are black, the tail grey. The length of the body from snout to root of tail is about two feet three inches; that of the tail, seven inches and a half.

It is fond of retired places, such as sheltered woods, and in them it makes for itself a large burrow or earth "which has but a single entrance from without, but afterwards divides into different chambers, and terminates in a round apartment at the bottom, which is well lined with dry grass and hay." The Badger is consequently a very skilful digger, and for this purpose is possessed of strong curved claws. Its diet is completely mixed: it eats roots, fruit, eggs, small mammals, frogs, insects, &c. It is quite susceptible of domestication, and is said to show a vast amount of affection and good temper. As to its habits, we cannot do better than quote an excellent account of some half-domesticated Badgers given in a letter to *The Times* by Mr. Alfred Ellis, of Loughborough:—"About ten years since, the Badger was established here, but it was not until the third attempt that my efforts prospered. The Badgers then introduced, or their successors, have bred every year, and as not more than one pair remain in permanent occupation it is probable that there are many more of these animals in this country than is generally supposed; but their shyness, their colour, and the short time they require to obtain their food, and the recesses of the woods in which they delight to dwell, make it no easy task to study their life and habits. The deep earth in which our Badgers live is only fifty yards from the window at which I write. The building of this house two years ago did not disturb them, and they have shown an increasing confidence and trust. The Badger breeds later than the Fox, and it was the middle of March this year before the preparations for the coming family were made. These consisted in cleaning out the winter bed, and replacing it by a quantity of dry fern and grass, so great that it would seem impossible the earth could receive it. In June the first young Badger appeared at the mouth of the earth, and was soon followed by three others, and then by their mother. After this, they continued to show every evening, and soon learnt to take the food prepared for them. The young are now almost full grown, and, forgetting their natural timidity, will feed so near that I have placed my hand on the back of one of them. The old ones are more wary, but often feed with their family, though at a more cautious distance. Their hearing and sense are most acute, and it is curious to see them watch, with lifted head and ears erect, then, if all is quiet, search the ground for a raisin or a date. But the least strange sight or sound alarms them, and they rush headlong to earth with amazing speed.

"The Badger, like the Bear, treads upon the whole heel, and its walk closely resembles that animal. They caress each other in the same grotesque manner while they gambol and play, and at times they utter a cry so loud as to startle any one ignorant of its source. It is not unlike the chatter of the Stoat, but many times louder. On fine evenings we can watch them dress their fur-

* *Meles vulgaris.*

BADGER.

like coats, or do kind offices for each other, and search for parasites after the manner of Monkeys. No creature is more cleanly in its habits. Over their earth hangs a birch-tree, from which grows a horizontal bough eighteen inches from the ground. On this they scrape their feet in dirty weather, and keep their house inodorous by depositing their excrement at one place for many months and covering it with earth. The hibernation of the Badger is not like that of the Hedgehog—continuous and complete—but is irregular, and is probably influenced by the character of the winter. I have known the mouth of the earth covered with a coat of snow for fourteen days, and it might have been much longer before they came forth, while they may sometimes be tracked in a thin snow for a long distance.

"As the winter approaches, the old bedding is replaced by dry fern and grass, raked together by their powerful claws. This is often left to wither in little heaps till dry enough for their purpose. Partially concealed, I have watched a Badger gathering fern and using a force in its collection quite surprising.

"Bell, in his 'Quadrupeds' quotes Buffon as stating that Badgers are fond of Wasps' nests. This is true, for, like the Bear, they love honey and sweet food. I once heard a pair of Badgers fighting, and crept upon the ground until within a few yards of the angry conflict, but the bracken hid them from view. Next morning I visited the place. A Wasps' nest had been stormed and eaten; very little of the comb remained, and not a dozen homeless Wasps. That summer I myself saw the wrecks of seven Wasps' nests taken by the Badgers in one field, and this autumn they are digging out every one they can find.

"The Badger and and the Fox are not unfriendly, and last spring a litter of cubs was brought forth very near the Badgers; but their mother removed them after they had grown familiar, as she probably thought they were showing themselves more than was prudent."*

Although far from common, the Badger is found in many parts of Great Britain and on the Continent. Closely allied species occur over a great part of Northern Europe and Asia.

In former times it was in great requisition for the so-called sport of "Badger baiting," in which charming and refined amusement the unhappy animal was put into a barrel and attacked by an unlimited number of Dogs, amongst whom it was often able to do considerable execution, thanks to its sharp teeth and powerful jaws.

THE AMERICAN BADGER.†

The distinction between this species and the European Badger consists chiefly in the shorter and more hairy character of the snout, and in the fact that the body is of a uniform whitish hue, sometimes shaded with grey or tawny. The body and head together are about twenty-four inches long, the tail six inches. It is found throughout the greater part of North America.

In its shyness, its general mode of life, and its habits, it differs but slightly from the Common Badger. Although in many parts it is so numerous that its burrows form a very serious obstacle to the traveller, yet it is a comparatively rare thing to see a specimen, so immediately does it retire to its strongholds on the first intimation of man's approach. It can, however, be trapped without much difficulty, and thousands are caught in this way every year. In 1873 the Hudson's Bay Company sold 2,700 in London alone. Dr. Coues quotes an interesting account of the habits of a captive Badger. He says:—"In running, his fore-feet crossed each other, and his body nearly touched the ground. The heel did not press on the ground like that of the Bear, but was only slightly elevated above it. . . . We have never seen any animal that could exceed him in digging. He would fall to work with his strong feet and long nails, and in a minute bury himself in the earth, and would very soon advance to the end of a chain ten feet in length. In digging, the hind as well as the fore-feet were at work, the latter for the purpose of excavating, and the former (like paddles) for expelling the earth out of the hole; and nothing seemed to delight him more than burrowing in the ground. He seemed never to become weary of this kind of amusement; and when he had advanced to the end of his chain he would return and commence a fresh gallery near the mouth of his first hole. Thus he would be occupied for hours, and it has been necessary to drag him away by main force. He

* *The Times*, Oct. 24th, 1877.

† *Taxidea americana.*

lived on good terms with the Racoon, Grey Fox, Prairie Wolf, and a dozen other species of animals. He was said to be active and playful at night, but he seemed rather dull during the day, usually lying rolled up like a ball, with his head under his body for hours at a time."

THE TELEDU.*

This animal, sometimes called the "stinking Badger," is found only in Java and Sumatra, and in those islands only on mountains having an elevation of more than 7,000 feet above the sea. It is a little more than a foot long; has a pig-like head, a stout body, very short legs, and a stumpy tail, not more than an inch long. The feet are plantigrade. It is of a dark brown colour, with the exception of a white band running along its back. But one of its chief characteristics is its power of ejecting, from its tail-glands, a volatile fluid, the odour of which is said to be even as bad as that of the Skunk.

The Teledu lives in burrows during the day, and comes out at night to seek its food, which consists chiefly of earth-worms, insects, and their larvæ.

THE CAPE ZORILLA.†

An ally both of the Skunks and Badgers, the Zorilla may be said to take the place of the former animals in Africa, through the whole of which continent it extends, reaching also into Asia Minor. The body, which attains a length of about a foot, is moderately stout, of a shining black ground-colour, and marked with white bands and spots. The snout is elongated like that of the South American Skunk (*vide infra*); the tail is bushy, about eight or nine inches long, and striped or spotted.

The Zorilla lives upon small mammals, birds, and their eggs, as well as amphibia and crustácea. It is a determined enemy to poultry, and entails great loss to the inhabitants of the districts where it is found, but is often tamed, and used to catch Rats and Mice. In the matter of scent, the secretion in its tail-glands is worthy of comparison with that of the Skunk itself.

An allied form is the Indian genus *Helictis*, a Weasel-like animal with a long body, and of a grey-brown colour, white underneath, and marked along the back with a white stripe. The tail is long and bushy. This animal is found from Nepaul to Java in the south, and Formosa in the east.

THE COMMON SKUNK.‡

This notorious American species is a stoutly-built animal, with short legs, a long conical head with a truncated snout, and a long bushy tail. The general colour of the fur is black, or nearly so, but on the forehead there is a white streak, and on the neck a white patch, from which two broad bands of the same hue proceed backwards along the upper surface of the body. The length from tip of snout to root of tail is something over a foot; the tail itself is less than a foot in length. The general appearance of the animal is decidedly Badger-like; it has, in fact, a good deal of resemblance both to the Ratel and to the Teledu. As in the Weasel, Ermine, and Polecat, there is one molar on each side of the upper, two on each side the lower jaw; altogether there are thirty-four teeth. It occurs throughout the whole of the temperate portion of North America.

We have mentioned that several of the Weasel family enjoy the distinction of being able to eject a foul-smelling fluid from glands at the root of the tail. In this accomplishment the Skunk is the undoubted chief. It can eject its perfume to a considerable distance, and with unerring aim: and the smell! The "odour of mingled guano and Polecat," which, according to Mr. Kingsley, distinguishes the ancient Cornish dainty squab-pie, is simply nothing in comparison with the horrible stench emitted by this little animal. It is so durable, that the spot where a Skunk has been killed will often retain the scent for days, or even weeks; indeed, Audubon relates that at one place where a Skunk had been killed in the autumn, the odour was quite perceptible in the following spring after the snow had melted. Clothes defiled with the secretion cannot be thoroughly cleansed by any ordinary means: for even if the scent seems to have disappeared, it will make itself evident every time the wearer goes near a fire.

* *Mydaus meliceps.* † *Ictonyx zorilla.* ‡ *Mephitis mephitica.*

or into the sun. Notwithstanding this, furriers have found out a way for effectually purifying Skunk-skins, which are now a good deal used as furs. In Britain, where the Skunk is not known in the flesh, these furs are called by their right names, but in America, where the inhabitants do not enjoy the same blissful ignorance of this noxious beast, they are dignified with the appellation of "Alaska sable."

But the scent of the secretion is not its worst feature. Sir John Richardson quotes Mr. Graham as saying "that he knew several Indians who lost their eyesight in consequence of inflammation, produced by this fluid having been thrown into them by the animal," and continues, "I have known a dead Skunk, thrown over the stockades of a trading-port, produce instant nausea in several women, in a house with closed doors, upwards of a hundred yards distant." Dogs often suffer from inflamma-

SKUNK.

tion of the eyes after being squirted with the fluid, and appear to be almost distracted with the pain. Curiously enough, the secretion has been recommended as a cure for asthma. "The story is told of an asthmatic clergyman who procured the glands of a Skunk, which he kept tightly corked in a smelling-bottle, to be applied to his nose when his symptoms appeared. He believed he had discovered a specific for his distressing malady, and rejoiced thereat; but on one occasion he uncorked his bottle in the pulpit, and drove his congregation out of church." *

The efficacy of the secretion as a defensive weapon for the not otherwise formidable animal is greatly enhanced by the distance to which it can be ejected. This is probably as much as twelve or fourteen feet, while the smell itself can be perceived for a comparatively immense distance.

Besides its perfume, the Skunk has yet another claim to careful avoidance: its bite has been known in many cases to produce hydrophobia, in a form quite indistinguishable, according to an American surgeon, Dr. Janeway, from that induced by the bite of a rabid Dog.

* Coues.

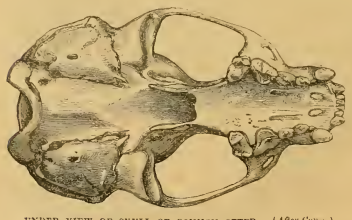
An allied species, the Little Striped Skunk,* is less than a foot long, and the tail is shorter than the body. The fur is black, and marked with numerous white stripes and spots. It is found in the southern part of the United States, and is said to be readily capable of domestication, proving very serviceable as a Mouser. Of course, under these circumstances, the glands are removed while the animal is young.

The White-backed Skunk† is the South American form of the genus. It occurs throughout that Continent as well as in Mexico and the south-western portions of the United States. It is much larger than the northern species, attaining a length of from eighteen inches to two feet, and is further distinguished by its short white tail, which does not exceed nine or ten inches in length, its pig-like snout projecting a full inch beyond the mouth, and its white back sometimes marked by a median black stripe. The rest of the fur is, as usual, black.

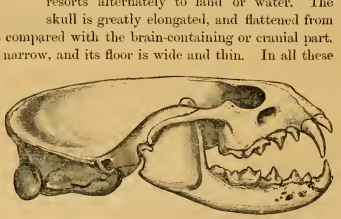
Our friend, Mr. Purdie, whose acquaintance with the Skunk in South America has been of the most practical kind, assures us that when about to discharge its secretion, the animal invariably faces round, so as to look its enemy full in the face, throws its tail over its back, and allows the breeze to carry the fluid in the desired direction. This method of discharge seems highly unaccountable, and difficult to reconcile with the anatomical facts; but it would be certainly going too far to say that it is impossible. Dr. Coues, who has repeatedly observed the North American Skunk, states that the animal invariably turns its back to its intended victim.

THE COMMON OTTER.‡

We now come to the most thoroughly aquatic of the Fissipedia, the sub-family of Otters, animals which, although quite capable of active and unembarrassed movement on land, are yet thoroughly at home only in the water. In accordance with this mode of life, the toes are webbed, and provided with very short claws, and the tail is long, tapering, and flattened, so as to serve the precise purpose of the corresponding appendage in a fish. The length of the head and body is about two feet, that of the tail, one foot five inches. The fur is of a soft brown colour, becoming lighter on the under side of the throat and the breast, and consists of long, coarse, shining hairs, with a short under-fur of fine texture, well calculated to preserve equality of temperature as the animal resorts alternately to land or water. The skull is greatly elongated, and flattened from above downwards; the facial part of it is small, as compared with the brain-containing or cranial part. The region of the skull between the eyes is very narrow, and its floor is wide and thin. In all these points, save the first mentioned, the skull of the Otter approaches that of the Seal. As to the teeth, there is one premolar less on each side of the lower jaw than in the Martens,§ and both molars and premolars have sharp-pointed cusps, quite like those of the other *Mustelidæ*.



UNDER VIEW OF SKULL OF COMMON OTTER. (*After Coues.*)



SIDE VIEW OF SKULL OF COMMON OTTER. (*After Coues.*)

The habits of the Otter are so entirely aquatic, that in the good old times it was thought to be a sort of cross between a beast and a fish, just as the Bat was thought to be intermediate between a beast and a bird. So deeply rooted was this opinion that the Otter's flesh

* *Mephitis* (or *Spilogale*) *putorius*. † *Mephitis* (or *Conepatus*) *mapurito*. ‡ *Lutra vulgaris*.

§ The dental formula is—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{3-3}$; molars, $\frac{1-1}{2-2}$ = 36.

was considered quite fishy enough to be eaten by devout Catholics on fast days. To this Izaak Walton alludes in a well-known passage in his "Complete Angler."

"*Piscator.* 'I pray, honest huntsman, let me ask you a pleasant question: do you hunt a beast or a fish?'

"*Huntsman.* 'Sir, it is not in my power to resolve you: I leave it to be resolved by the College of Carthusians, who have made vows never to eat flesh. But I have heard the question hath been debated among many great clerks, and they seem to differ about it, yet most agree that her tail is fish; and if her body be fish too, then I may say that a fish will walk upon land.'"

The movements of the Otters in water are marvellous. They swim about in families, performing the most astonishing pranks, from mere exuberance of spirits and excess of energy. Nothing can give a better idea of their activity, than the description of them in that most delightful of natural history books and fairy tales, "Water Babies."

"Suddenly Tom heard the strangest noise up the stream; cooing, and grunting, and whining, and squeaking, as if you had put into a bag two Stock Doves, nine Mice, three Guinea-pigs, and a blind puppy, and left them there to settle themselves and make music. He looked up the water, and there he saw a sight as strange as the noise; a great ball rolling over and over down the stream, seeming one moment of soft brown fur, and the next of shining glass: and yet it was not a ball; for sometimes it broke up and streamed away in pieces, and then it joined again; and all the while the noise came out of it louder and louder.

"Tom asked the Dragon-fly what it could be: but, of course, with his short sight, he could not even see it, though it was not ten yards away. So he took the neatest little header into the water, and started off to see for himself; and, when he came near, the ball turned out to be four or five beautiful creatures, many times larger than Tom, who were swimming about, and rolling, and diving, and twisting, and wrestling, and cuddling, and kissing, and biting, and scratching, in the most charming fashion that ever was seen. And if you don't believe me, you may go to the Zoological Gardens (for I am afraid that you won't see it nearer, unless, perhaps, you get up at five in the morning, and go down to Cordery's Moor, and watch by the great withy pollard which hangs over the backwater, where the Otters breed sometimes), and then say, if Otters at play in the water are not the merriest, lithest, gracefullest creatures you ever saw."

The Otter makes a sort of nest in hollows in the banks of the river in which it lives, but does not, as is sometimes stated, construct complicated burrows: its claws, indeed, are too weak for any such work. It usually confines itself to rivers, but is sometimes found on the sea-shore.

Otter hunting was formerly a very favourite sport. It was conducted with a special breed of Dogs—the Otter-hound—(see p. 141), and the spear was used for killing the animal when brought to bay.

Otters are quite capable of domestication, and may be taught to catch fish for their masters. For this purpose they must be caught young, and gradually brought to live upon bread and milk. When this end is attained, they are taught to fetch and carry, like a Dog—first sticks, &c., then a stuffed fish, then a dead one. When this part of their education is perfect, and they make no attempt to mangle the fish given to them, they are sent into the water to catch living fish. Otters are trained for this purpose in India, and also in China, where they are used by the fishermen of the Yang-tse-kiang. Mr. J. Thomson* says:—"We noticed men fishing with trained Otters in this part of the river. There were a number of boats, and each boat was furnished with an Otter tied to a cord. The animal was thrust into the water, and remained there until it had caught a fish; then it was hauled up, and the fisherman, placing his foot upon its tail, stamped vigorously until it had dropped its finny prey."

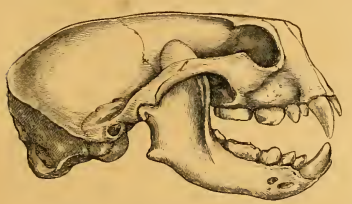
There is one peculiar habit of the Canadian Otter† which is worthy of mention. "Their favourite sport is sliding, and for this purpose in winter the highest ridge of snow is selected, to the top of which the Otters scramble, when, lying on the belly, with the fore-feet backwards, they give themselves an impulse with their hindlegs, and swiftly glide head foremost down the declivity, sometimes for the distance of twenty yards. This sport they continue apparently with the keenest enjoyment until fatigue or hunger induces them to desist."

* "Malacca, Indo-China, and China."

† *Lutra canadensis.*

COMMON OTTERS.

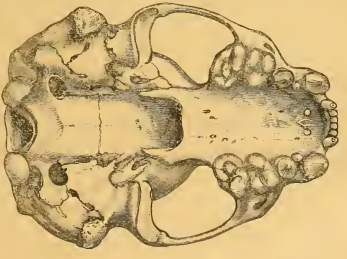
In the Margined-tailed Otter* the skull characters, which we have mentioned as distinctive of Otters, especially the narrowness of the region between the eyes, and the shortness of the nasal region, are so exaggerated, that the animal approaches towards the Sea Otter, of which we shall speak next. The Margined-tailed Otter, which is found in Brazil and Surinam, derives its name from a longitudinal ridge on each side of its conical tail. The fur is of a bright bay-brown colour, both above and below.



SIDE VIEW OF SKULL OF SEA OTTER. (*After Cones.*)

THE SEA OTTER.†

This interesting animal differs in many important respects from the Common Otter, and in all such points shows an approximation to the structure of the Seals. It is a large animal, about three feet long, not counting the tail, which is about a foot more. Its fur is dark brown, both on the upper and lower surfaces, and presents a frosted or silvered appearance, owing to the fact that the long stiff hairs, which differ greatly from those of the under-fur, are grey or colourless at the tip. The head is very short, the snout naked; the eyes extremely small, and placed low down on the sides of the head, and the whiskers are short, but stout and stiff, and mostly directed downwards; altogether there is something very Seal-like about the face. The fore-limbs and feet are small, the paws rather Cat-like in their rounded form, and the claws are quite hidden by the hair. The hind feet, on the other hand, are flat and expanded, being no less than six inches long by four broad, and webbed like a Duck's feet, or a Seal's flippers; they differ, however, from the Seal's, in the fact that the toes increase in length from the inner to the outer side; both above and below they are covered with dense fur, which quite hides the short, stout claws. The skull is, both in its cranial and facial portions, much shorter in comparison with its width than in the ordinary Otters; its base is extremely broad, and both upper and lower jaws bear on each side only eight teeth, so that there are altogether thirty-two teeth, or four less than in the Common Otter.‡ This diminution in number is brought about, as will be seen from the formula below, by reducing the upper premolars from four to three, and the lower incisors from three to two on each side. The form of the grinders differs altogether from what we have found, not only in the Mustelidæ, but in all the Land Carnivores. Their grinding surfaces present no sharp cusps, or jagged cutting edges, as in most Carnivorous forms; neither are they provided with numerous small tubercles and ridges, as in the Bears; but the surface of each is raised into a small number of rounded eminences, reminding one of the "roches moutonnées" of a glacial district, or, as Dr. Cones remarks, differing from the teeth of ordinary Carnivores, as water-worn pebbles differ from fresh-chipped angular pieces of rock.



UNDER VIEW OF SKULL OF SEA OTTER. (*After Cones.*)

The Sea Otter is found in the North Pacific, chiefly in the regions of Kamstchatka and Alaska, and extends as far south as California.

Like the Seal, the Sea Otter is gregarious, being often found "in bands numbering from fifty up to hundreds. When in rapid movement, they make alternate undulating leaps out of the water,

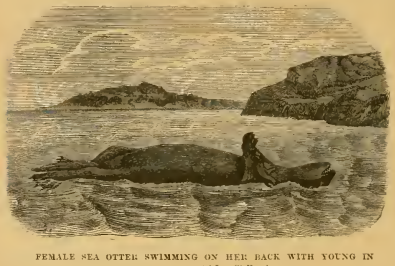
* *Pteronura Sandbachii.*

† *Enhydra lutris.*

‡ Dental formula—Incisors, $\frac{3-3}{2-2}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{3-3}$; molars, $\frac{1-1}{2-2} = 32$.

plunging again as do Seals and Porpoises. When in a state of quietude, they are much of the time on their backs. They are frequently seen in this posture, with the hind flippers extended, as if catching the breeze to sail or drift before it. They live on Clams, as well as Crabs and other species of Crustacea; sometimes small fish. When the Otter descends and brings up any article of food, it instantly resumes its habitual attitude on the back to devour it. On sunny days, when looking, it sometimes shades its eyes with one fore paw, much in the same manner as a person does with the hand."* This curious habit, as we have seen, is adopted also by the Glutton. The supine position is so habitual that the females actually sleep in the water on their backs, with the young ones clasped between their fore paws. While in this position, too, the Otter will toss a piece of sea-weed backwards and forwards from paw to paw, like a ball, and the mother play with her offspring for hours together.

The fur is very valuable, and the animal is consequently hunted regularly; so regularly, that there is every possibility of the species becoming speedily extinct unless some check is put upon the chase. For taking some action in the matter, there is the further reason that the natives of the Aleutian Isles, the chief resort of the animal, are dependent on its hunting for their subsistence, and it has been shown that the people have diminished in numbers coincidently with the Otters.



FEMALE SEA OTTER SWIMMING ON HER BACK WITH YOUNG IN HER ARMS. (*After Steller.*)

"There are four principal methods of capturing the Sea Otter, namely, by *surf-shooting*, by *spearing-surrounds*, by *clubbing*, and by *nets*.

"The surf-shooting is the common method, but has only been in vogue among the natives a short time. The young men have nearly all been supplied with rifles, with which they patrol the shores of the island and inlets, and whenever a Sea Otter's head is seen in the surf, a thousand yards out even, they fire, the great distance and the noise of the surf preventing the Sea Otter from taking alarm until it is hit: and in nine times out of ten, when it is hit in the head, which is all that is exposed, the shot is fatal, and the hunter waits until the surf brings his quarry in, if it is too rough for him to venture out in his 'bidarkie.' This shooting is kept up now the whole year round.

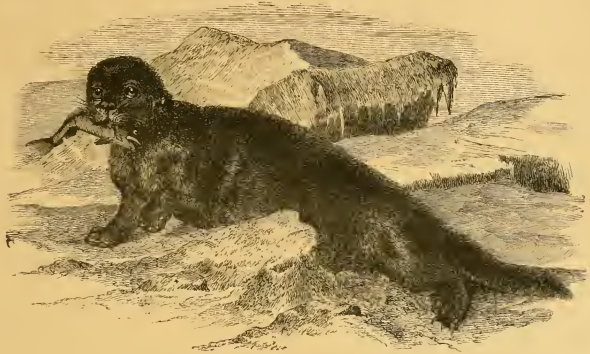
"The spearing-surround is the orthodox native system of capture, and reflects the highest credit upon them as bold, hardy watermen. A party of fifteen or twenty bidarkies with two men in each, as a rule, all under the control of a chief elected by common consent, start out in pleasant weather, or when it is not too rough, and spread themselves over a long line, slowly paddling over the waters where the Sea Otters are most usually found. When any one of them discovers an Otter asleep, most likely, in the water, he makes a quiet signal, and there is not a word spoken or a paddle splashed while they are on the hunt. He darts towards the animal, but generally the alarm is taken by the sensitive object, which instantly dives before the Aleut can get near enough to throw his spear. The hunter, however, keeps right on, and stops his canoe directly over the spot where the Otter disappeared. The others, taking note of the position, all deploy and scatter in a circle of half a mile wide round the point of departure thus made, and patiently wait for the re-appearance of the Otter, which must take place within fifteen or thirty minutes, for breath; and as soon as this happens the nearest one to it darts forward in the same manner as his predecessor, when all hands shout and throw their spears, to make the animal dive again as quickly as possible, thus giving it scarcely an instant to recover itself. A sentry is placed on its second diving-wake as before, and the circle is drawn anew;

* Capt. C. M. Scammon, "American Naturalist," Vol. IV., 1870.

and the surprise is often repeated, sometimes for two or three hours, until the Sea Otter, from interrupted respiration, becomes so filled with air or gases that he cannot sink, and becomes at once an easy victim.

"The clubbing is only done in the winter season, and then at infrequent intervals, which occur when tremendous gales of wind from the northward, sweeping down over Saanach, have almost blown themselves out. The natives, the very boldest of them, set out from Saanach, and scud down on the tail of the gale to the far outlying rocks, just sticking out above surf-wash, where they creep up from the leeward to the Sea Otters found there at such times, with their heads stuck into the beds of kelp to avoid the wind. The noise of the gale is greater than that made by the stealthy movements of the hunters, who, armed with a short, heavy, wooden club, dispatch the animals one after another without disturbing the whole body, and in this way two Aleuts, brothers, were known to have slain seventy-eight in less than an hour and a half."

The nets used by the Atka and Attore Aleuts "are from sixteen to eighteen feet long, and six to



SEA OTTER.

ten feet wide, with coarse meshes made nowadays of twine, but formerly of sinew. On the kelp-beds these nets are spread out, and the natives withdraw and watch. The Otters come to sleep or rest on these places, and get entangled in the meshes of the nets, seeming to make little or no effort to escape, paralysed, as it were, by fear, and fall in this way easily into the hands of the trappers, who have caught as many as six at one time in one of these small nets, and frequently get three. . . . No injury whatever is done to these frail nets by the Sea Otters, strong animals as they are; only stray Sea Lions destroy them. . . . . The salt water and kelp seem to act as a disinfectant to the net, so that the smell of it does not repel or alarm the shy animal."*

GENERAL RELATIONS OF THE LAND CARNIVORA, RECENT AND FOSSIL.

From very obvious reasons we have been compelled to describe the various forms of Land Carnivora of which we have been able to take account, one by one, beginning with Cats, and ending with the Otters. But the reader will already have discovered that a linear arrangement like this gives no true conception of the relations existing between the various families of which the sub-order is composed, or of the various genera which are included in the families. For cross-relationships of the most puzzling and often complicated description are perpetually turning up: among the Æluroids, for

* H. W. Elliott, quoted by Coues, "Fur-bearing Animals."

instance, we found Cryptoprocta to be intermediate between Cats and Civets, and yet, if we had followed the order indicated by this relationship, we should have had to ignore the close connection between Cats and Hyænas, and that between Hyænas and Civets, through the intermediation of the Aard Wolf.

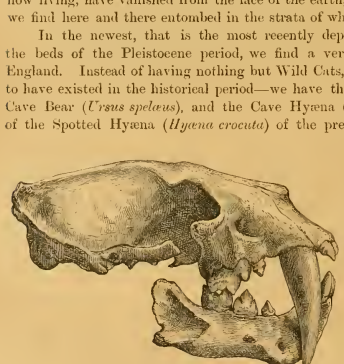
It is necessary, then, to devise some method of writing down the names of the families, other than that of placing them one under the other, if we are to get anything like a clear notion of their mutual relationships. The method adopted by Professor Flower is perhaps the most convenient, and following him, we arrange the groups thus :—

Felidæ.	Hyænidæ.			Ursidæ.
Cryptoproctidæ.	Protelidæ.	Canidæ.	Procyonidæ.	Ailuridæ.
Viverridæ.			Mustelidæ.	

In this scheme we see an expression of the fact that the Dogs (*Canidæ*) form a central group, from which the families of the Æluroidea—those to the left—diverge in one direction, and the families of the Aretoidea—those to the right—in the other direction. The Civets (*Viverridæ*) and the Weasel family (*Mustelidæ*), being the least modified of the Æluroid and Aretoid sections respectively, are placed at the bottom of the table, the Cats (*Felidæ*) and Bears (*Ursidæ*), being the most modified, are placed at the top. The two latter families, again, are placed at opposite extremities of the table, as far from one another as possible, to indicate the great gap which separates the digitigrade, short-skulled, active, carnivorous Cats, from the plantigrade, long-skulled, clumsy, herbivorous Bears. To be quite accurate, such a scheme should take account not merely of families, but of genera : in our table, for instance, there is nothing to show the immense amount of specialisation undergone by one section of the *Mustelidæ*—the Otters—to fit them for aquatic life ; but such a detailed arrangement is quite beyond the scope of the present work.

In considering the chief forms of Carnivora existing at the present day, we have by no means exhausted this varied and interesting group, for a number of its members, the forerunners of those now living, have vanished from the face of the earth, and are known to us only by their bones, which we find here and there entombed in the strata of which the crust of our earth is composed.

In the newest, that is the most recently deposited, set of strata, those which together form the beds of the Pleistocene period, we find a very curious change in the flesh-eaters inhabiting England. Instead of having nothing but Wild Cats, Wolves, and Bears—the only wild beasts known to have existed in the historical period—we have the enormous Cave Lion (*Felis spelæa*), besides the Cave Bear (*Ursus spelæus*), and the Cave Hyæna (*Hyæna spelæa*), the last being merely a variety of the Spotted Hyæna (*Hyæna crocuta*) of the present day. The presence of the first and last of these would seem to indicate that the climate of Britain was warmer in the Pleistocene period than it now is; but the presence of the Glutton, as well as of some non-carnivorous Arctic animals, tends to the other opinion, namely, that the climate of England was sub-Arctic. Very probably the Cave Lion and Hyæna were provided with thick woolly fur, and so, like the Manchurian Tiger and the Northern Leopard (see pp. 34 and 42), enabled to bear a degree of cold experienced by but few of their relatives at the present day.



SKULL OF MACHÆRODUS. (*After Gaudry.*)

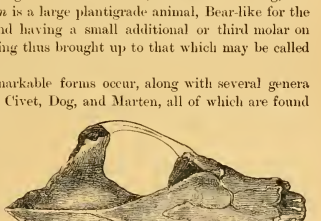
In beds of the same age in South America is found a true Cheetah, a species now confined to the Old World. But the most wonderful animal belonging to this period is the great Sabre-toothed Tiger (*Machærodus*), a gigantic animal, with canines six or eight inches long, and jagged at their edges like a very fine saw. It would almost seem as if Dame Nature, in producing this terrible beast, had actually got to the end of her tether in the matter of specialisation for carnivorous habits ; the canines

of Machærodus were so long that he must have had some difficulty in opening his mouth sufficiently wide to take in anything large, and thus it would seem that he actually overshot the limit of perfection, and died of over-specialisation. The canines of the Sabre-toothed Tiger are, however, not its only peculiarity: there is one less premolar on each side of the upper jaw than in the modern members of the Cat family, so that the total number of teeth is reduced to twenty-eight,* the smallest number found in any of the Carnivora.

On descending to the rocks of Pliocene age, we find, amongst many forms existing at the present day, an animal called *Galecynus*, about the size of the Fox, and possessing many characters, in its teeth, limbs, &c., intermediate between those of the Dogs and those of the Civets. Another genus, *Hyænarctos*, is almost exactly half-way between Dogs and Bears; its molars have less of a cutting character than a Dog's, and less of a grinding character than a Bear's, and its front premolars, though much smaller than a Dog's, do not fall out altogether, as in the Bear.

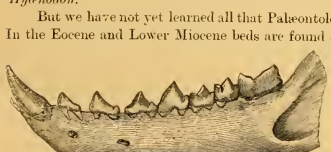
In the Pliocene, or Late Miocene strata, remains have been found of many existing genera, such as Cats, Civets, Hyænas, Dogs, Weasels, Ratels, and Otters; but amongst these are several genera not occurring in any of the more recent strata, and all, or nearly all, tending to bridge over the gaps which separate existing families from one another. For instance, a perfect gradation between the Hyænas and Civets is afforded by two genera, *Hyænictis* and *Ictitherium*: while *Lutrictis* shows affinities both with Civets and Otters, *Hemicyon* with Dogs and Gluttons, and *Dinictis* with Cats and Weasels. Another very interesting genus, *Promephitis*, belongs undoubtedly to the Weasel family, but is intermediate between its three sub-families, the Weasels proper, Badgers, and Otters. *Simocyon*, again, an animal about the size of a Leopard, is described as having the canines of a Cat, the molars of a Dog, and jaws shaped like those of a Bear. Lastly, *Amphicyon* is a large plantigrade animal, Bear-like for the most part, but with trenchant molars, like a Dog's, and having a small additional or third molar on each side of the lower jaw, the number of its teeth being thus brought up to that which may be called the typical Mammalian number, namely, forty-four.†

In the Eocene, or Lower Tertiary, still more remarkable forms occur, along with several genera existing at the present day, such as the Cryptoprocta, Civet, Dog, and Marten, all of which are found in the upper or more recent strata of the Eocene formation. But lower down the genus *Cynodon* also connects Dogs with Civets; and in the very lowest beds occurs a large plantigrade animal (*Arctocyon*), with a very small brain-case, wide jugal arches, a complete set of forty-four teeth, and altogether of a generalised character. In the Eocene of North America, *Limnocyon* and *Prototomus* occur low down, and in the Middle Eocene a form as large as a Lion has been discovered, to which the name *Limnofelis* has been given, and also *Orocyon*, and some allies of the *Hyænodon*.



SKULL OF ARCTOCYON. (*After Gaudry.*)

But we have not yet learned all that Palæontology can teach us about the history of the Carnivora. In the Eocene and Lower Miocene beds are found animals referred to the genera *Hyænodon*, *Pterodon*, *Palæonictis*, and *Proviverra*, which, not content with trespassing on the boundaries between existing families, actually wander outside the Carnivorous order altogether, and approach so nearly to the Marsupials (Kangaroos, Opossums, &c.) that many competent anatomists have proposed to place them in the latter group. The premolars and molars in these extinct animals have sharp cusps, and

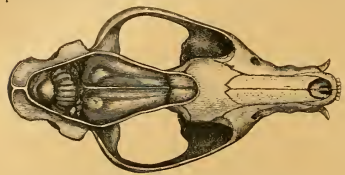


LOWER JAW OF HYÆNODON. (*After Gaudry.*)

* The dental formula is—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{2-2}{2-2}$; molars, $\frac{1-1}{1-1} = 28$.

† The dental formula is—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{3-3}{3-3} = 44$.

increase gradually in size from before backwards; so that, of the whole grinding series, the first premolar is the smallest, and the last molar the largest. Now we have seen that the rule among existing Carnivora is for the last molar to be a small tooth, and for the largest of the set to be the fourth premolar in the upper jaw, and the first molar in the lower jaw. On the other hand, the regular increase in size is very characteristic of the flesh-eating Marsupials, amongst which the Thylacine, or so-called Tasmanian Wolf, shows a considerable resemblance, as to its teeth, to *Hyænodon* and *Pterodon*, while *Palæonictis* and *Proviverra* are more nearly allied to the Opossums and to the Dasyure, or Tasmanian Devil. The brain-case in these forms was very small, and a cast of the interior of the skull of Proviverra, figured by M. Gaudry,* shows that the brain must have had an extremely low character.



SKULL OF PROVIVERRA. (*After Gaudry.*)
The roof of the skull is supposed to be cut away to show the form of the brain, as deduced from a natural cast of the interior of the skull.

We thus see that a considerable number of the existing genera of Carnivora took their origin in the Eocene epoch, where they co-existed with creatures curiously intermediate between the various existing families, and with others intermediate between Carnivora and Marsupials. In the rocks of the Secondary period (chalk, oolite, lias, &c.), none of the Carnivora have as yet appeared, and only Marsupial remains are found.

APPENDIX TO CHAPTER VI.
(VIVERRIDÆ, CIVET FAMILY.)

THE CYNOGALE.†

ALTHOUGH in all essential respects a true Viverrine, the Cynogale, or Mampalon, differs very considerably in external appearance from all the members of the family we have hitherto considered. It has none of a Civet's lithe and slender appearance, but is stout and plump. Its tail is very short, not more than six inches long, or a quarter the length of the head and body, which together attain a length of about two feet. The snout is long and pointed, the muzzle bald, and the ears very short; the whiskers are decidedly extensive in their development, for besides the usual hairs on the snout, there are two large bundles of long bristles on the cheeks, one a little in front of and below the eye, the other in front of the ear. The limbs are short and stout, and the digits are five in number, slightly

CYNOGALE.

* "Les Enchainements du Monde animal, dans les temps géologiques." Paris, 1878.

† *Cynogale Bennettii.*

webbed at the base, and provided with short, retractile claws. The close thick fur is of a yellowish-brown colour, lighter on the under side of the head, and over the eyes, and darker on the legs. The mode of progression is nearly plantigrade.

There is not much known of the habits of the Cynogale, except that it frequents the neighbourhood of water, and is also a good climber. It is found in the island of Borneo.

THE CYNICTIS.*

This animal, a near relative of the Ichneumons, is found in South Africa, where it is represented by three species. The head and body attain a length of about half a yard; the tail of about a foot. The pelage is smooth, of a reddish colour, darker on the head and limbs; the tail is bushy, of a greyish colour, and tipped with white. There are five toes on the fore foot, three on the hind foot.

MANGUE.

THE MANGUE.†

The Crossarchus, Mangue, or Kusimanse, presents a good deal of resemblance to the Cynogale, but differs from it in having rough fur and a comparatively long tail. It is also a much smaller animal, not exceeding fourteen or fifteen inches in length from snout to root of tail, which latter appendage is about eight inches in length. The body is thick and stout: the fur brown, becoming lighter on the head: the ears are short, and the snout is long and flexible, projecting some distance beyond the mouth, somewhat like that of the Coati. The secretion of the tail glands is very fetid.

The single species of Crossarchus is found in tropical Africa. Very little is known of its habits in a wild state; in captivity it soon becomes tame, and seems to prefer animal to vegetable food.

THE SURICATE.‡

This is a South African species, and, as in the case of the last two forms, little or nothing is known of its habits in a state of nature. It is about the size of the Crossarchus, the body and head

* *Cynictis penicillata.* † *Crossarchus obscurus.* ‡ *Suricata zenick.*

attaining a length of about thirteen, the tail of about six inches. The body is of a greyish-brown colour, marked along the back with yellowish-grey transverse stripes. There is a black patch round the eye, bordered by a lighter area, and the ears and the end of the tail are also black. As in the Cynogale, the head is rounded, the snout long, and the ears short. The legs are much longer than in

SURICATE.

either of the preceding genera, and the feet are distinguished by being provided with only four instead of five toes. The claws are very long and curved, and, as might be judged from this, the animal is addicted to burrowing.

There are several of these pretty little animals in the Zoological Gardens, where their innocent faces and quiet ways distinguish them very favourably from their relatives, the Ichneumons, which are perpetually quarrelling in the most outrageous fashion.

William Kitchen Parker.
Thomas Jeffery Parker.

THE AQUATIC OR MARINE CARNIVORA.

CHAPTER I.

INTRODUCTION—THE WALRUS, OR MORSE.

Pinnipedia distinctly Aquatic—The Three Families—Their Common Characteristics—Skeleton—Mobility of Figure—Feet—Dentition—Skull—Tongue—Stomach—Intestine—Peculiar Disposition of Blood-vessels of Liver—Lungs—Sense of Smell—Larynx—Brain—Sense of Hearing—The Walrus Family—Characteristics—THE WALRUS, OR MORSE—Geographical Distribution—Fossil Forms—Weight—Size—Appearance in Old Age—Mode of Walk—Habits—On Guard—In the Water—Attacked—Tusks—Dentition of the Young—Uses of the Tusks—Food—Long Fasts—Story of "Jamie," a Tame Walrus—The Young—Maternal Affection—Massacre—Walrus as an Article of Diet.

THE Walrus, the Sea Lions, and the Seals, collectively termed the Pinnipedia,* or by some Pinnigrada,† constitute the second well-marked group or sub-order of the Carnivora. They are truly inhabitants of the high seas, the land being to them only an occasional resort, when procreation or other causes induce short visits, or temporary residence thereupon. In the previous chapters it has been noted that certain of the so-called Land Carnivora, the White Polar Bear, or the Common Otter (*Lutra*), for example, take freely to the water, and even subsist on finny and other prey derived therefrom, but nevertheless, as a rule, such Carnivora only peradventure are semi-aquatic. The one notable instance to the contrary is the Sea Otter (*Enhydra*), an animal seldom seen on land, though rarely met with far from rocky reefs and islets. Besides mere habit, the Polar Bears and Otters in some points of their organisation—particularly the conformation of the skull of the first, and webbed toes and abundant under-fur in the two last—show a partial gradation and tendency of structure towards their strictly marine brethren, the Seal tribe.

The group of the Pinnipedia is one in which considerable interest is centred, and this for several reasons. Their history, as handed down by classical lore, has a shade of the mythical, and well shows how fable has become engrafted on fact. Within the last two centuries their pursuit has been brimful of incident and adventure. As articles of commerce, the oil and the furs of certain kinds of the Seal tribe are of immense importance; whilst the mere hides of all, besides the Walrus tusks, are commodities of great value. Indeed, to the natives of the Arctic regions, Seals are indispensable as a means of every-day existence. But to the naturalist the fact of their being Carnivores peculiarly adapted to an aquatic life, and the study of their habits generally, are subjects of intense interest.

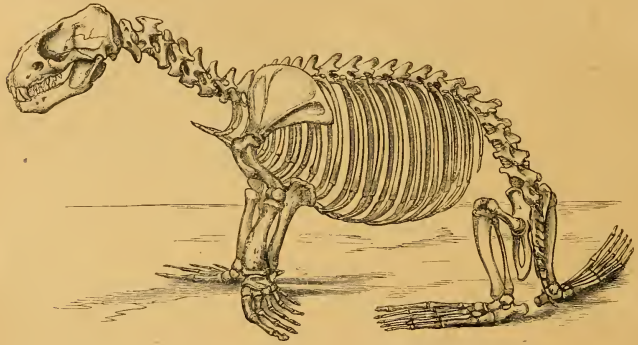
Moreover, the gradual, in some instances sudden, diminution of Seal life at the hand of man, points to a possible early period of their extinction, as in the case of the Whales and Manatee tribes, and warns, like the Roman story of the Sybilline books, that if we would read the history of the past, the knowledge must be culled ere the records are swept beyond recall.

The three families of the Pinnipedia are denominated in technical language the Trichechidæ,‡ the Otariidæ,§ and the Phocidæ.‖ The first has but one living representative, the Walrus, or Morse; the second contains the so-called Sea Lions and Sea Bears, more distinctively known as Eared Seals; in the third family are ranged the ordinary Seals, contra-distinguished as Earless Seals. Sufficiently different among themselves in general aspects and habits, as to be recognised at a glance, the three families, nevertheless, have characteristic features common to all, wherefrom the sub-order has received its name. Their toes are united nearly throughout by a web of membrane, as in a duck's foot, which converts the paws into broad, fin-like organs (the flippers), well adapted for swimming purposes. This feather-footed, pinnipedal condition is associated with a shortening of the upper segments of the limbs, and such peculiar attachment especially of the hind-legs as to leave little more than the feet free. The body is long, usually ample and fleshy at the neck and shoulders, but narrows taperingly behind towards the rump. The head is either flattish and elongated or more or less rounded, but in all cases relatively small to the bulk of the animal. External ears are absent save in the Otary family, which possess a diminutive, conical, or pear-shaped ear-conch. The eyes are full, and often expressive, though usually on land bearing a drowsy look, from their vision being adapted for a watery medium.

* *Pinna*, a fin; *pes*, a foot. † *Pinna*, a fin; *gradus*, a step. ‡ From the Greek, θρίξ, a hair, and ἔχω, I have.
§ From the Greek, οὖς, ὠτός, an ear ‖ From the Greek, φώκη, a seal.

Unless as the merest rudiment, there are no eyelashes or eyebrows. The muzzle is dog-like, but with long, stiff, though exceedingly mobile moustaches. In the Walrus, however, chiefly on account of its huge tusks, this part of the face is immensely dilated, fleshy, and covered with great pliable bristles, like knitting-needles in calibre; these latter and tusks being adaptations suited to the animal's mode of feeding. The skin of the body fits loosely, and there is a thick layer of oily fat beneath, its amount depending on general condition, season, and sex. The hairy covering is of two sorts, a stouter, coarser, and at the roots a much shorter, softer kind. As it appears ordinarily, the hair seems uniform and short, and when wetted it clings close to the skin, so that the surface then is smooth and polished, becoming rougher as it dries. Now, it is the soft under-wool, which is in great abundance in some of the Sea Lions only, that constitutes the fur of commerce.

In the skeleton it is to the amount of cartilage between the bones, along with the gristly rods attaching the ribs to the back and breast-bones, that the extraordinary mobility of figure

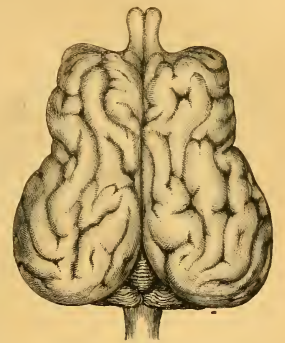


SKELETON OF OTARIA IN THE ATTITUDE OF WALKING. (*Reduced after Murie.*)

on land, and easy motions of swimming in the water, which belong *par excellence* to the Marine Carnivora, are due. Add to this that the hip-bones are narrow and remarkably compressed, the thigh-bones excessively short, the shank-bones long and tied in behind, while great hind-flippers, like double oars rearwards, drive or steer with sculling sweep. The bones of the fore-limb and its modified foot altogether are strong, and remarkably so in the powerful-swimming Sea Lions. All four feet have excessively long toes, the thumb-bones being longest, the fingers lessening to the little toes; in the hind-foot the three middle toes are shorter than the two outer ones. There are tiny nails on each toe at the bone ends, beyond which is a flat spatula-shaped cartilage, of excessive length in the Otary family. The webbed flat feet are thus altogether very peculiar, and when used the entire sole, even including wrist and ankle-bones, is laid flat on the ground, so that two families of the Pinnipedia are really more plantigrade than the Bears. The Common Seals, or Phocidæ, however, never use the hind-feet on land, and the fore-feet but sparingly, while their nails are more claw-like than in their marine congeners. In none of the Seal tribe, though, are the nails or claws retractile, as previously has been shown (p. 12) in the Cat and Lion.

The skull in the three families presents modifications partly adapted to their different habits and modes of life, and partly to their race characters. In none, however, do we find the peculiar scissor-like or cutting teeth (see p. 13) of the typical Land Carnivora, but, as in the Bear tribe, the dentition exhibits a diminution in the cutting form of the teeth, and a tendency in some of the creatures to a levelling and conical production of the crown of the molars, while in others these latter show a serrate or saw-like character. For example, in the Walrus all the teeth, save the canines, are

short and simple-fanged, the canines themselves, or, as they are more commonly termed in this animal, tusks, being of inordinate length and strength. In the Otariidæ, the canines, though themselves of good size, are small in comparison with those of the Morse tribe, while the incisors and single-rooted molars are more conical and prominent. The dentition of the Phocidæ varies considerably, in some the occasionally double-rooted molars acquiring a tuberculate, in others a saw-like or serrate character, while the incisors are notch-crowned. The bony cavity for the eye is open behind; the facial region is less prominently produced than in some of the feline Carnivora. The region of the brain-pan is relatively full, while the skull, as a whole, is elongated and flat. In youth, the cranium of the Pinnipedia has a predominating brain area, and the entire bony surface is smooth and featureless. As age advances, however, in certain of the genera at least, the relation of parts changes, and the face acquires prominence, while great bony crests arise on the summit and back of the head. The tongue does not possess the spines met with in the Cat tribe, though the surface is roughish. In the Seals, but not in the Walrus, the tip is slightly cleft. The stomach is single-chambered. The intestine is considerably longer than in the Felidæ, averaging fifteen times the length of the body, or thereabouts. The glands of the internal coat in some of the tribe are very extensive, and co-ordinate with the excessively rapid digestion.



UPPER SURFACE OF BRAIN OF OTARIA.
(*After Murie.*)

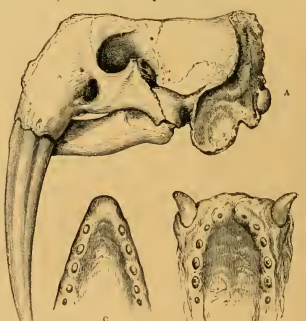
TONGUE AND BACK PARTS OF MOUTH OF OTARIA. (*Reduced after Murie.*)
t, Right Tonsil; *u*, Uvula, or Curtain; *T*, Tongue.

A curious point in connection with the veins entering the liver is their enormous dilatation. This, by some writers, has been regarded as the means whereby the animal is enabled to remain submerged, the blood being held in these reservoirs instead of passing on towards the heart and lungs to be aërated. But whether this peculiar disposition of the blood-vessels is necessarily connected with diving powers, up to the present time has not been satisfactorily decided. Whatsoever the relation between structure and habit in this respect, it has been observed that the staying-power of the Seal tribe under water increases from youth to age. In the Pinnipedia, the lungs, relatively, are capacious, the animal rising to breathe air at intervals from ten minutes to half an hour or more, when at the surface taking a long and deep inspiration. The nostrils are under the influence of strong fleshy bundles, which firmly compress the orifices when below water. Their sense of smell is well developed, and the larynx simple. The brain in all is not only large, but far surpasses in volume and in amount of convolutions that of the Land Carnivora as a whole. Their docility and intelligence, especially when young, are often remarkable. The voice is plaintive or bellowing, but wanting the great compass and strength of the Felidæ. The nerves supplying the organs of smell, sight, and hearing are large, and the last is most unusually acute. Indeed, it is possibly to hearing more than to the other senses that the Seal tribe are dependent for their safety and living. The facts of sound readily travelling under water, of solid ice being also a good conductor, and of the quietness of the frozen regions, all tend to render this faculty of the highest service, nay, a necessity, to the creatures possessing it. Particularly is the faculty of hearing essential when the Pinniped goes on land, for in the rarer medium of the air its vision is defective, the construction of the lens, &c., being that best fitted for sight under water.

I.—THE WALRUS FAMILY (TRICHECHIDÆ).

This family in some points resembles the Eared Seals, or Otaries, and in others approaches the Earless Seals, or Phocidæ. The characters of the family are mainly, if not wholly, derived from the Walrus, the only living representative. There are no external ears, but a fair-sized opening indicates the passage. Both sexes, when adult, possess two immense tusks in the upper jaw, quite a notable feature. Along with this, there is full development of the bony parts to accommodate them, and the huge, though abruptly truncated muzzle, is garnished with long and remarkably strong bristly moustaches. The semilunar-shaped nostrils, situated above these, are dilated or powerfully compressed at will, by the thick, fleshy muscles of the upper lip. The eye is smaller than in the Otariidæ and Phocidæ. The body, especially its hinder part, is also heavier. The tail seems absent, though, in reality, nearly reaching to the heels, but a broad flap of skin stretches across from leg to leg, and binding these, hides the tail. The hind limbs appear shorter than in the two neighbouring families, but the above tail-membrane is wider, and allows greater freedom to the legs and feet. The three middle toes are shortest, as is the case with the Common Seals, but not the Otaries. The fore-legs are of intermediate length, strong, stumpy, and although the thumb is biggest, there is a certain equality in the length of the toes. The fore feet, as well as the hind feet, are sufficiently free to be laid flat on the ground. The nails are diminutive, and not claw-like, and the soles of the feet are unusually rough and warty. The tongue is smooth, and not cleft at the tip. The dental series is as follows:—Incisors, $\frac{1-1}{0-0}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{3-3}{3-3}$; molars, $\frac{2-2}{1-1} = 24$. The tusks, or upper canines, lie outside and almost in front of the dental arch. The incisor and grinding teeth are uncommonly alike, being short, cylindrical, and obliquely truncated at their crowns. The teeth alone are very distinctive of this family, and modified for uses and a diet *sui generis*. There is no such development of a thick coating of under-fur, as in certain of the Otary family, the root hairs being sparse, and the larger sort softer, shaggier, and not so close pressed as in the Seals.

HEAD OF WALRUS. (*Modified after Muric.*)



SKULL AND DENTITION OF WALRUS. (*After De Blainville and Muric.*)

A, Skull of Old Animal; B, Palate and Dentition of Young; C, Lower Jaw and Dentition of Young.

THE WALRUS, OR MORSE.*—So far as looks are concerned, scarcely a more uninviting fellow can be conceived than this animal, which the Greenlanders and Eskimo call "Awŭk," from its peculiar guttural cry. It is better known among our own countrymen as the Sea Horse, though naturalists more frequently prefer Walrus, or Morse, words respectively modified derivatives from the old Norse and Lapp languages. Its present range

* *Trichechus rosmarus.*

is a narrow belt girding Labrador, Hudson's and Baffin's Bays, and skirting the East Greenland coast towards Spitzbergen and Nova Zembla, and still farther stretching on to Behring's Strait and the islands off Alaska. Certain writers are inclined to regard the animal found in the North Pacific as a different species from that inhabiting the North Atlantic seas; but on this head no very justifiable evidence is yet offered. Meantime, its geographical distribution, briefly defined, is the Arctic Circle. Here, thinned by its hereditary enemy, the Polar Bear on the land side, and stricken down wholesale by man seawards, the day of its extermination seems not far distant. The living Walrus, indeed, presents to us a solitary example of a family once more numerous and widespread, and doubtless coincident with a period when climate was different from that now existing where their fossil remains have been discovered. In the deposits of Virginia, on the American Continent, in the Suffolk crag, and possibly in contemporaneous beds around the neighbourhood of Antwerp, bones of Walruses allied to the present northern form have been dug up. But others, moreover, have been found which, from greater size and characteristic peculiarities, evidently belonged to at least two genera (*Trichechodon* and *Alachtherium*) distinct from the Arctic animal. Thus, by degrees, the more massive representatives of the family Trichechidæ have died out, while the last of the descendants visibly diminish amongst the bergs of their secluded, ice-bound home.

The Walrus of the present day is a creature which attains large dimensions. Elliott mentions a great fellow, shot in the Behring Sea, nearly 13 feet long, and with a girth of 14 feet; and he estimates the gross weight of an ordinary full-grown male at 2,000 lbs. Well have some likened the hide, which is of a tawny brown colour, to a tough, flexible coat of mail, which harpoon and even bullets penetrate with difficulty. In old age these creatures do not only become obese, shapeless masses, but their gnarled hide, scarred by tusk-marks, bullet, or harpoon wounds, gets blotchy, pustular, and hairless. This, with small, fierce, bloodshot eye, in marked contrast with that of the Seals, and formidable pair of tusks, gives it a ferocious and demoniacal look.

The unusually flattened head seems disproportionately small to the great neck and sack-like body, the tusks and moustaches being all in all either in profile or front view. Their movement on land is very awkward and droll. With high-set shoulders and low hind-quarters, and squat limbs to their heavy body, the fore feet are successively thrust flat forwards from the wrist, each followed by a hitch and swing of the hind foot, as from a pivot on the heel, ending in a sudden sort of jerk or check. Thus they straddle in a clumsy, indolent way along the rough ice, in emergency exerting themselves into a kind of hobbling canter.

This ungainly creature, though so repellent in features, is in reality quiet and inoffensive, unless attacked or roused in love-time, when woe betide those who measure his strength, especially if he reach his native watery element. They are very gregarious, seldom being met with singly, but often in herds from a dozen to several hundreds, as Captain Cook long ago observed. They crowd up from the water on to the rocks or ice one after the other, grunting and bellowing. The first arrived is no sooner composed in sleeping trim, than a second comes prodding and poking with its blunt tusks, forcing room for itself, while the first is urged farther from the water; the second in turn is similarly treated by the third; and so on, until numbers will lie packed close, heads and tails resting against and on each other, in the most convenient and friendly manner possible. There they sleep and snore to their hearts' content, but nevertheless, according to Elliott, keep guard in a singular fashion. Some one would seem to disturb another; then this fellow would raise his head listlessly, give a grunt and a poke to his nearest companion, who would rouse up a few minutes, also grunt, and pass the watchword to his neighbour, and so on through the herd, this disturbance always keeping some few on the alert. Danger announced, they scuttle pell-mell and topsy-turvy into the water.

Once in the sea, their sluggish deportment vanishes, and activity is the order of the day. Curiosity aroused, or attack threatened, as Lamont remarks, the herd keep near each other. One moment a crowd of grisly heads and long, gleaming white tusks are above the waves; then follow snorting and hasty breathing; immediately thereafter, a host of brown hemispherical backs, followed by pairs of flourishing hind-flippers, and the lot have dived, again to appear at an interval, and the same performance be gone through. If one gets injured, or a young one is in danger, the host of Walruses close round the boat, grunting, rearing, and snorting, and if their wrath be roused, they

rush simultaneously to the fight, and attack the boat. When a young Sea Horse is wounded, the parent becomes desperate, and fearlessly exposes herself, or seizes the youngster under her fore-flipper, and makes off, or defends herself and progeny to the death. There is no security to the hunter on the ice, which the animal in its fury will break through, even when six inches thick.

The tusks vary from eight inches to two feet long, and may weigh from five to fifteen pounds; in the males they are generally supposed to be thicker and more divergent. These teeth continuously grow, and, as they wear away, their interior becomes filled with tooth bone. In the young Walrus, there appears to be more teeth than in the adult; but these, as Professor Flower has shown, are exceedingly diminutive denticles, and may or may not remain through life. The first tooth of the molar series in the upper jaw, as in the Dog and other Carnivora, has no predecessor; but the second and third are preceded by milk teeth. In the lower jaw there are three milk teeth.

The formidable canines, when employed as offensive weapons (Lamont notes), not only are used downwards, but by a quick turn of the neck the animal strikes upwards and sideways with equal dexterity. Again, in raising the body out of the water on to the ice-floe after the first jerk forwards, the tusks are dug into the ice with terrific force, and thus the body is hauled on till footing is gained. Broken tusks are by no means rare. But the most important function performed by the tusks is as instruments for procuring food. A part of its time is spent by the Morse on banks and among shoal water, where lie buried in the mud shell-fish in abundance. Certain kinds of Mussels and Cockles are here dug up by the tusks and gulped, often shells and all; but occasionally it swallows Shrimps, Star-fish, and marine worms. Dr. Robert Brown states that whenever killed near a Whale's carcass, the stomach of the Walrus was invariably found crammed with the Whale-flesh. Some say they eat sea-weeds; but the young animal possessed by the Zoological Society, though tried by Mr. Bartlett, refused these, but greedily took Mussels, Whelks, Clams, and the stomachs and intestines and other soft part of fishes cut small. This said young one could not swallow anything larger than a walnut, and from the way in which it used its mouth bristles, in brushing backwards and forwards the food and sucking everything through them, their use as a sieve was very manifest.

Whatsoever their diet they thrive on it, and store up much fat, though less proportionally than Seals. Like some of the Sea Lions, they have the curious habit of swallowing stones, the economy of which is imperfectly understood. But there can be no doubt of the fact, or of another equally strange, that of their protracted fasts. During the autumn months the Sea Horses will muster in force on land, and quite lethargic there doze for days or weeks without tasting food, thus recalling the hibernation of the Bear tribe. The Walrus is infested with skin-parasites and intestinal-worms, and the pebble-swallowing habit is supposed to relieve the irritation of the latter.

Not unfrequently a troop will be found sleeping bolt upright in the water, and so soundly that a boat can approach close to them before they awake. They can remain under water, some say an hour, before requiring to take breath, but the length of time doubtless depends on circumstances; and ordinarily, or when suddenly disturbed, barely a third of that time.

The brain is largely developed, and has many sinuosities, so that in comparison with the Dog or Cat tribes the Walrus ought to possess considerable intelligence. Acts displaying this quality, however, are only sparingly manifested in the young where domestication has been attempted.

A surgeon who accompanied one of the Dundee sealers relates how a juvenile Walrus, being captured, became in a few days quite at home, and a general favourite among the crew. It quickly formed a friendship with an Eskimo Dog which was on board. They ate out of the same dish, although "Jamie," the Walrus, took good care always to secure the larger share. Whenever the Dog retired to his barrel to sleep, "Jamie" bundled his own fat carcass right on the top of him, and as doggie rebelled against such an unwieldly bedfellow it usually ended in "Jamie" having it all to himself. The latter ate blubber, beef, pork, and almost everything given him, but his favourite dish was pea-soup. Into this he would plunge his face, which procedure left him a most comical countenance. He seemed to know his name well, for even if fast asleep the instant any one cried out "Jamie!" he would rouse up, gaze anxiously about, grunt, grunting in reply. But the most remarkable trait in his character was an intense hatred of solitude. When alone on deck he appeared a picture of misery, grunting and endeavouring to make his way down "'tween deck" after the men; and on more than one occasion precipitated himself, to his peril, plump down the main hatchway, a height of about nine

feet. If the cabin-door were open he at once waddled in, laid himself before the stove, and went to sleep; but if the cabin were empty he would not remain a moment. Nothing made him so angry as to shake a piece of paper in his face, or to run suddenly away after caressing him; he then followed with open mouth in a great passion. When a Whale had been killed, and the ship's crew busy on deck, "Jamie" was in his glory in the very midst of the men covered with grease and oil. At these times he was a perfect nuisance, hindering the men in their duties by continually poking his head first between one seaman's legs and then another's, and so on, meantime running a chance of being cut down in the "flensing" operations. He evinced no particular attachment to any one individual on board, liking all equally from cabin-boy to captain. But he knew full well when he did anything wrong; for if a rope's-end were shown him in a threatening manner, "Jamie" instantly would slink off,

WALRUSES ON THE ICE.

furtively casting a look over his shoulder to see if he were followed. After being on board four months he fell ill and died. The expression of this creature's countenance during his sickness was indicative of a great desire for sympathy from any one who came near. He took his medicine to the last, and when his remains were committed to the deep, regret was felt by all on board.

The Walrus, unlike the Sea Lions, is believed to be monogamous. It is known, however, that in the islands of Behring's Strait the female gives birth at nine months to a single young one, usually on the ice-floes. The Seals show a remarkable change in the colour of their coat at different periods of their life; but the young Walrus resembles its parents, though it has no tusks, these not protruding to any great extent for two years after its birth. The young evidently suckle their mother up to the period just mentioned, and this seems necessary, because in the absence of tusks the former are unable to procure the shell-fish and other nourishment by digging. It is quite possible that the attachment and maternal instinct of the helplessness of her great full-grown baby to forage and protect itself in part lead to that abandonment of self conspicuously shown in the heartrending stories of hunters. Whether the Morse has the marked migratory habits which we shall afterwards show

obtain among the Seals is uncertain. Circumstances rather tend to prove it to be more permanent in its resorts, though occasionally some individuals must straggle from the herd, since at intervals its occurrence on the British coast has been recorded. Undoubtedly its area is decreasing, and the remaining few seek unfrequented spots in high latitudes less accessible to the sealers. In former days their abundance is historically handed down to us in the fact—as Dr. Rink, Dr. Robert Brown, and others tell us—that the Greenlanders "paid their tribute to the Crusades in the shape of Walrus-tusks, delivered in Bergen in 1327, and their weight is noted in a receipt which is still in existence." But a century ago their numbers were enormous, on the shores of the Gulf of St. Lawrence, sixteen hundred being slaughtered at an onset. Among the first voyagers to Spitzbergen it was no uncommon thing to slay hundreds in a few hours. Lamont tells a story of four boats' crews, in 1852, massacring nine hundred Walruses in a herd of some thousands which they discovered in one of the small islands to the south of Spitzbergen. So greedy were the hunters that half of their spoil had to be left behind, and the rotting carcases afterwards raised such a stench that the animals deserted this previously favourite haunt, a sad lesson of man's inhumanity and savage lust of gain.

The more general opinion is that the flesh of the Walrus is tolerably palatable, and certainly the Eskimo consider the hide a dainty for dessert. The tongue, at least, is excellent, and a favourite dish amongst the whale-fishers and the crews of the various Arctic expeditions. Lamont, dining on stewed Walrus veal, mentions its being slightly insipid, but good eating notwithstanding; the old animal's flesh, however, is by no means so universally admired, although Arctic crews, at a pinch, much prefer it to salt junk.

At one time a considerable trade was devoted to Walrus-hunting, but the diminishment of their numbers has practically reduced it to the lowest ebb. The tusks alone have now any commercial significance, but formerly Walrus hides were used for various purposes, such as machine-bands, carriage-springs, rigging of ships, and the like.

CHAPTER II.

II.—THE SEA LION FAMILY (OTARIIDÆ).

Various Names—Peculiarities of Distribution—Characteristics of the Family—Dentition—Skull—Fossil Remains—Distinction between Fur and Hair Seals—Preparation of the Seal-skin—THE NORTHERN FUR SEAL—History—The Pribyloff Islands—Male, Female, Young—"Hauling-grounds"—Wintering—Males at the Islands in Spring—Desperate Battles for Seaward Positions—Approach of the Females—Struggles for Wives—The Young—Abstinence from Food, Water, and Sleep for more than Two Months—Neutral Ground in the "Rookeries"—Habits of the Young—Food—Annual Slaughter—Estimated Numbers—Mode of Killing—STELLER'S SEA LION—GILLIESPIE'S HAIR SEAL—HOOKER'S SEA BEAR—The Wreck of the *Grafton*—Musgrave's Narrative—Sufferings of the Castaways—Their Experiences among the Sea Bears—THE WHITE-NECKED OTARY—Distribution—Description—"Counsellor Seal"—THE PATAGONIAN SEA LION—Historical Associations—Impetus to the Study of the Family—François Lecomte—Its Docility and Intelligence—Its various Performances—Voracity—Lecomte's Observations—Habits—THE FALKLAND ISLAND FUR SEAL—Habitat—The Hunters' Boats—Driven from their Haunts—Captain Weddell's Observations—Great Wariness and Speed—Size—Habits—THE SOUTH AFRICAN, OR CAPE FUR SEAL—THE NEW ZEALAND FUR SEAL—THE ASH-COLOURED OTARY—Peron's Services to Science.

THE old voyagers have termed, and the present race of sealers know, members of the Otary family by such names as Sea Lion, Sea Leopard, Sea Bear, Sea Wolf, Sea Dog, &c., and these terms have even passed from seamen to science. The Otariidæ, like the Common Seals, are found both in the northern and southern hemispheres, but it is a remarkable fact that the species (some would even say genera) inhabiting the northern and southern regions are perfectly distinct the one from the other. Nay more, the one seems representative of the other. For example, there are a certain number of Fur-bearing Seals, and a certain number of Hair Seals, distributed over a wide area of the Arctic and Antarctic Circles, which, in either case, are spread hither and thither into more temperate latitudes. Indeed, the most recent observations tend to show that these animals are migratory in habit, and frequent certain given localities at regular intervals.

Much confusion for a long time reigned concerning the species of the Sea Lions. This difficulty

SEA LION.

(*From the Living Specimen in the Zoological Gardens, London.*)

has arisen from several reasons. Sealers have long distinguished the two kinds, namely, Fur Seals and Hair Seals; but among the thousands and thousands of skins annually brought home, little attention was paid to the animal from which the different skins were obtained, other than to its mere market value. While skins, and occasionally skulls or skeletons, found their way into our museums, seldom have these specimens been certified as belonging to one and the same individual; and in other cases they have been so mixed that identification has been little short of a riddle. Failing precision with regard to skins and skulls, the anatomists have been too prone to found genera and species on imperfect data, ignoring differences of sex, age, and the like, and thus many technical divisions have been introduced which we hardly think it worth while here rigidly to follow.

The family Otariidæ, or Eared Seals, was distinguished, and so named by the French naturalist M. Péron early in this century, from the animals of this section possessing a small scroll-like external ear, an appendage wanting in the Seals generally. They moreover differ from the latter, and resemble the Walrus, inasmuch as they can freely progress on all-fours on land. Their skull is somewhat Bear-like, the neck being long. The fore-limbs, set well back, are tolerably free, and rest on a thin, broad, but flat hand of great size, encased in a leathery-like substance. The thumb is remarkably stout, and far exceeds the other fingers in length, and on all the merest indications of nails are present. Each finger is tipped with a long spatular cartilage, as are the toes of the hind feet, thus giving them great flexibility. The hind limbs are not so loosely attached by the tail membrane as in the Walrus, and the short tail is apparent close to the heels. The great toe is by far the longest and strongest, size diminishing from this to the little toe. As a rule, this family are nimbler on land than is the Walrus family, though both walk flat-footed in a somewhat similar fashion. The gait of the Otaries, however, from the slightly greater restraint of their closer-linked hind quarters and legs, and from the lengthening of their fore-flippers, is ridiculously peculiar. The fore-flippers, as Mr. Frank Buckland drolly observes, remind one of Bob Ridley's shoes in a nigger performance. From the wrist they flop, flop, in a semicircle as right and left foot is alternately raised, while the hind quarters hitch, hitch, as each hind foot comes wobble, wobble, under the belly, the great toes even overlapping the fore-flipper. The Sea Lions have long, stout, exceedingly mobile whiskers, though these are by no means so profuse, thick-set, or strong as in the Walrus. Their skeletons differ from the latter in several particulars of minor importance, the chief distinctions being in the skull and dentition. There are on each side three incisors in the upper jaw, and two in the lower. The middle ones are smallest, the upper outer ones more often very large. The canines are still larger, and recurved; but though powerful, not to be compared with the great tusks of the Morse. There are more commonly five teeth of the molar series, of which the crowns are bluntly conical, and the roots simple. The milk-teeth are mostly shed before birth. The dental formula of the Otariidæ may be represented thus:- Incisors, $\frac{3-3}{2-3}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{2-2}{1-1} = 36$. The fore part of the skull is not so swollen out and abrupt as in the Walrus, the smaller size of the canines not requiring such space. In youth the skull is long, low, and flat, but in the old males there arise bony crests and processes, altering the shape, especially behind, so that recognition of the species is even difficult.

EAR OF OTARIA. (*Natural size.*) *After Murie.*

TEETH OF OTARIA. (*After De Blainville.*)

As the habits of the family of the Eared Seals are in the main very similar, and seeing how difficult it is from mere outward inspection to tell one species from the other, it seems advisable to follow Mr. J. W. Clark's mode of treatment, and consider all under the single genus

Otaria, though incidentally allusion will be made to such forms as are indicative of generic distinction.

We have in passing mentioned two kinds, namely, Fur and Hair Seals, and we have also stated that these Eared Seals are not confined to one hemisphere, but equally inhabit northern and southern regions. Taking these facts into account we submit the following table as a kind of provisional arrangement for the reader, that he may carry away a notion of what may be termed a combination of commercial and geographical divisions.

Northern.		*Southern.*
The Northern Fur Seal.	Fur Seals.	The Falkland Island Fur Seal. The South African, or Cape Fur Seal. The New Zealand Fur Seal. The Ash-Coloured Otary.
Steller's Sea Lion. Gillespie's Hair Seal.	Hair Seals.	Hooker's Sea Bear. White-necked Otary. The Patagonian Sea Lion.

Thus eliminating doubtful forms, or such as naturalists are not unanimous upon, there are, so to say, some ten well-marked species of Otaries, whereof five belong to the so-called Fur, and five to the so-called Hair Seals. In the northern region there are but three peculiar to the West American coasts, &c., whereas seven inhabit the southern region. These latter range over a wide area, from warmer latitudes to the frigid zone. But it is very remarkable that in the whole of the Northern Atlantic none of the Sea Lions are now to be found. It is, however, noteworthy that in the neighbourhood of Antwerp, Professor P. J. Van Beneden has described some few fragmentary remains of a Seal allied to *Otaria*, which he has named *Mesotaria ambigua*. These fossil bones, along with numerous other remains of Pinnipedia and Cetacea, have been dug out of the upper Tertiary strata of Flanders.

As regards the precise geographical distribution, this will be referred to in connection with the species themselves. The absolute distinction between Hair and Fur Seals is one rather of degree than of kind, for as we have before hinted, all the family possess, at least in their early condition, evidence of under-fur, sparse or otherwise. But undoubtedly as age advances in some kinds it is very abundant, in others quite the reverse. Hence this character, though so apparent in some cases, is not one thoroughly to be relied on so far as zoological divisions are concerned, though very considerable stress has been laid upon it by some writers. So far as the skin is looked on as a mercantile commodity it unquestionably is a most useful mode of division, but a classification founded thereon must be taken with the accustomed "grain of salt."

If we look at a lady's Seal-skin jacket, we at once observe its rich brown colour, and the velvety softness and denseness of the fine hairs composing it. If this be compared with the coarse, hard, or salted dry Seal-skin as imported, or, still better, with the coat of the living Fur Seals, one is struck with the vast difference between them, and wonders how the coarse or oily-looking, close-pressed hair of the live animal can ever be transformed into the rich and costly garment above spoken of. Passing our finger among the hairs of the Cat or Dog, we may notice short fine hairs at the roots of the longer, coarser, general covering of the animal. This is the so-called under-fur. It equally obtains in most of the land as in the aquatic Carnivora. But in the greater number of these animals the short hairs are so few and often fine as to be comparatively speaking lost sight of among what to our eyes constitutes the coat. The remarkable feature, then, in the Fur Seals is its abundance and density. The operation which the skin undergoes to bring out, so to say, the fur may be briefly described as follows :—The skin, after being washed rid of grease, &c., is laid flat on the stretch, flesh side up. A flat knife is then passed across the flesh substance, thinning it to a very considerable extent. In doing this the blade severs the roots of the long strong hairs which penetrate the skin deeper than does the soft delicate under-fur. The rough hairs are then got rid of, while the fur retains its hold. A variety of subsidiary manipulations, in which the *pelt* is softened and preserved, are next gone through.

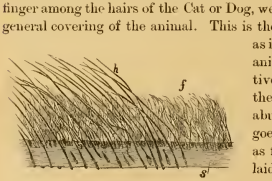


Diagram of a Vertical Section of the Skin of the Fur Seal, showing how (*h*) the coarser Hairs penetrate quite through (*s*) the Skin, while (*f*) the Fur has Roots comparatively superficial. (*After Murie.*)

These we need not enter into, but only further state that the fur undergoes a process of dyeing which produces that deep uniform tint so well known and admired. We may, however, mention that it is the dyeing process which causes the fur to lose its natural curly character and to present its limp appearance.

THE NORTHERN FUR SEAL.*—The habits and life history of this animal are probably more accurately known than those of any other of the Eared Seals. Fully a hundred and twenty years ago Steller, a naturalist in the employ of the Russian Government, spent a season in Kamstchatka and the islands in the neighbourhood of Behring Strait. During his sojourn he carefully studied the habits and anatomy of an animal termed by him Sea Bear, which existed in innumerable quantities in the region in question, publishing the results of his observations in the "Transactions" of the St. Petersburg Academy. A missionary, Krasheninikoff by name, some years later, under the title of Sea Cat, also gave an account of the same animal, but possibly deriving his information from the preceding writer. For a long period little was added to their narratives. In 1868 the Russian Government ceded to the United States the territory of Alaska, including several of the Aleutian Islands, and among others the Pribyloff group. These latter are remarkable and important, inasmuch as they are the resort of literally myriads of Seals, some of which are exceedingly valuable for their fur. A Captain Pribyloff had discovered the small island which bears his name in 1786, and thereafter a Russian company established themselves, carrying on an extensive trade in skins and oils up to the date of cession. The Russian Bishop Veniaminov, in 1840, gave an account of the Seals of the Pribyloff group, containing a statistical table of their probable numbers and evident decrease unless measures were taken to prevent their wholesale extermination.

The American Government wisely appointed agents, the result being reports by Captain C. Bryant and Mr. H. W. Elliott, which contained wonderfully graphic histories and descriptions of this Fur Seal and others of the group. To these gentlemen's reports we are chiefly indebted, and do not hesitate to abstract without stint.

The "Kautickie" is the name given by the Russians to this Fur Seal. It repairs to the Pribyloff Islands to breed in almost fabulous numbers, between the beginning of May and the middle of September, some few stragglers occasionally remaining even to the close of December; but between the beginning of June and end of September, they remain on the islands in grand force. The haunts of these creatures during the winter season, after leaving the islands, are doubtful; but it is supposed that they take up quarters by a southward migration to the Pacific coasts of the United States. At all events, it is known that in the stomachs of the voracious Killer-Whales and Sharks the remains of these and other species of Seal are not unfrequently obtained by the whalers in the region in question; and likewise the Indians of the North-west American coast, as low as California, then capture them in numbers.

The males, when full-grown, are between six and seven feet long, the females not being over four to four feet and a half in length, from head to tail. The former will weigh between four to six hundred pounds, the latter scarcely reaching one hundred pounds, but oftener eighty or less. The male, with a greyish shoulder, has the rest of the body varying from a reddish-grey to deep, almost pure, black; the nose and lips are brownish; the breast and abdomen with more of an orange and reddish-brown tint; the naked parts of the hind limbs are much blacker. The female is considerably lighter, being nearly uniform grey above, and brownish-grey on the sides. The young, previous to the first moult, is uniformly glossy black, with a yellowish-brown tint on the under parts. As it grows older, it becomes gradually lighter, especially in the females, and the two sexes then can hardly be distinguished. The distinction even in the young animal between the long, coarse hairs of the outer coat, and the dense silky fur of the inner coat, is very marked. There is occasionally some variation in the colour of the sexes, both as regards age and otherwise, but the above is that most common. The male of this Fur Seal does not attain its full size until about the sixth year, although it breeds at the fourth year. The females bear their first young when three years of age. The breeding-ground, or "rookery," as the colony of the Seals is termed, lies among the belt of loose rocks along the shores, between high-water line and the base of the cliffs, and varies in width from 60 to 150 feet. There are, besides, sand-beaches of large extent, and these stretch

* *Otaria ursinus*, the genus *Callorhinus* of certain authorities.

"ROOKERY" OF FUR SEALS.

more inland to grassy hillocks; the said areas are used as temporary resting-places, playgrounds, and neutral territory, where young, old, and infirm or wounded may resort to undisturbed. To these sandy beaches and uplands the term "Hauling-grounds" is given, from the manner in which the Seals drag themselves out of the water in going towards them.

From whatever reason, the adult males seem to leave the herd and betake themselves to the Pribyloff Islands in the spring months, when, in the first few days of May, they make their appearance, and in a suspicious, doubtful manner swim idly about, apparently reluctant to land. Soon, however, the older "bulls" approach the loose rocky shore, and commence to locate themselves. Each individual animal takes possession of a piece of ground about ten feet square, and, as those fresh from the sea approach, there begins a series of battles as to which is to retain the ground first occupied. All during the month of May, and even to the first week of June, this terrible warfare proceeds incessantly, and those next the water have to resist all comers, or themselves be forced farther back. Meantime, from the beginning till almost towards the end of June, the pregnant females make their appearance, first in small numbers, until the great body arrive in mass at the close of the month. Each male retains his position as best he can, whilst some of the females hesitate to land, calling out as if in search of some particular mate. The males coaxingly strive to inveigle them ashore, and no sooner do the females approach than they are laid hold of, and a general warfare among the whole "rookery" ensues. The quiet, unoffending, small-sized females are subjected to dreadful usage. The strong and powerful males secure, where possible, from twelve to fifteen partners in their seraglio, but to retain these is indeed a most serious business. Day and night the males, who have never left their station for at least six weeks, have still to keep watch and ward over their accommodating spouses, the only sense of *meum* and *tuum* being force. If the master of the harem dare for a moment to doze, down comes his more wideawake neighbour from behind, to obtain

by foul means what he cannot obtain by fair; or some slippery partner, desirous of change, seeks to escape the bondage of her lord. Then ensues internecine and domestic strife, in which all the neighbouring males join, whenever there is a chance of capturing a coveted female. The poor wives suffer equally with their spouses—trampled, bitten, and dashed about. It results that he alone keeps who has the power to withstand his numerous assailants. Some of the females may have the fortune to get more comfortably settled than others, which are bandied from one location to another, until most of the males obtain a few partners, the lucky ones in front securing and holding the greatest number, those behind being obliged to content themselves with half-a-dozen or thereabouts.

A few days only have elapsed, and matters settled down more quietly, when the females give birth each to a single one. The little fellows soon find their voice—a kind of bleat like a young lamb's,—begin paddling about, and then suckle. They gorge themselves heartily with the rich creamy

SEAL FIGHT.

milk. But, strange to say, the mother seems remarkably indifferent to her offspring; and, if it stray beyond the limits of the family group, it may be abducted by the other Seals for all that she cares.

About this time, many of the old males who have successfully held their position become exhausted, and now and again the less fortunate or single males behind, in stronger or fresher condition, drive the former from their posts, and the latter take their places. There is no wonder that exhaustion succeeds. Indeed, one of the most remarkable features in the history of these Sea Lions is that for two months and more these heroic males, that arrived fat and plump from their winter quarters, have held their positions on land against all comers, and this without tasting food, water, or almost sleep during this period. It seems scarcely credible that animals incessantly on the watch, excited and bearing the brunt of sanguinary contests, should be able to undergo starvation under such circumstances. This fact is almost unique in natural history; for, though hibernation for long periods is common to the Bear, Hedgehog, &c., their winter sleep is accompanied by cessation of all bodily exertion, and the functions of circulation, respiration, and digestion are comparatively at a standstill. In truth, how this and other species of Otaria, for the habit is not limited to the Fur Seal, endure such a lengthened abstinence, physiology fails to explain.

While the families, in groups as afore mentioned, with their dominate lords, hold the favourite

grounds, the great mass of the younger members of the community are not thoroughly excluded from the domains of the "rookery." By common consent, here and there long narrow lanes of neutral ground are left open from the beach upwards, and along these continually pass to and fro the non-breeding animals. These go to the rear, where they pack themselves in a kind of general medley, their gregarious nature leading them there to swarm.

The young animals in the beginning of August begin to take to the water, with which they soon become familiar, frolicking about, and returning like lazy Dogs to sleep after their exertions. They grow fast, and gathering in squads swarm over the whole "rookery." The colony now begins to break up from the family-parties first instituted. Some besport themselves, or possibly feed in the neighbourhood; others range on the sandy and grassy uplands, in groups of hundreds to thousands, and seem to play and enjoy themselves in a rollicking, lively manner. Their gambolling is very good-natured, then seldom quarrelling. They appear to delight in dashing through the breakers, and "hauling up" on the surf-beaten shore. In dull, foggy weather, they crowd close together in myriads, and a bright, warm day sends them off quickly to the water, seemingly to avoid heat.

What they live on during all this period it is difficult to state, for the fish round the island appear to be driven off on the arrival of the Sea Lions. They, nevertheless, subsist and thrive. In the stomachs of most of the older animals several pounds' weight of pebbles are usually found.

At one time 100,000 young males were killed annually, the females not being interfered with. This will show how enormous the number of Seals on these islands was. But the slaughter has not always been wisely regulated. When the Russian American Company first hunted, up till 1837, they ran great danger of exterminating all, killing every animal regardless of sex; and complications have occasionally arisen between the United States and Great Britain about the right of fishery, the former Government being desirous of preventing the extinction of the Seals, and on that account claiming a wide jurisdiction in the Behring Sea. Mr. Elliott, by roughly numbering the animals in a family group, and estimating the given area of the "rookeries" when the greatest mass are on shore, calculated the total numbers at between four and five millions.

The killing of these Seals is quite a peculiar occupation of the islanders. After the breeding season, the hunters take advantage of the dull and foggy weather, and creep down between the herd and the water. Then suddenly rising and shouting together they drive landwards the affrighted animals, though many of course escape. Closing on them, they allow the females and the very old males by degrees to pass, and then drive the remainder at a slow rate towards the killing-ground, some distance off. Watchers remain over night with them, and in the morning, when the Seals have rested and cooled down, the work of slaughter begins. Squads of forty or fifty are separated, and the islanders then surround these in a body, the animals meantime huddling together and treading over each other's flippers, cannot well attack or defend themselves, and they are then clubbed by blows on the head. While this bloody process is going on, a number of the men dexterously skin the animals, and others look after the blubber, and such parts as are useful for food and other purposes.

Steller's Sea Lion,* or the Hair Seal of the Pribyloffs, is an animal in some respects not unlike the Fur Seal originally described by the aforesaid Russian naturalist. But it is a much more powerful animal, and though in contiguity to its congener originally named by this author Sea Bear, it differs in habits as well as in other particulars, besides the broad fact of its possessing such sparse, and, when old, such absence of under-wool that it comes to be classed as a true Hair Seal. The male and female animal are of unequal size; the former attains a bodily length of eleven or twelve feet, and a weight of 1,000lbs. and more, while the latter is barely more than half the dimensions and weight of her partner. The male has quite a leonine appearance and bearing, and often exhibits great ferocity of expression. His colour is of a golden rufous tint, darker behind, or occasionally with brownish patches, the limbs more nearly approaching black. Some variation occurs with regard to the brindling and hue generally, the female being slightly paler than the male.

Their movements on land, though in many respects similar to, are not so free as those of the Fur Seal, and never are they found far from the water. Some of them herd along with the Fur Seals, their powerful organisation enabling them to hold and retain the shore locations. They, however,

* *Otaria Stelleri*, the genus *Eumetopias* of Gray and others.

SEA LIONS ON THE TARALLONE ISLANDS.

congregate in breeding-grounds slightly apart. While polygamous, they have not the regular system, nor give such attention to their harem as does the *Callorhinus*. In comparison with the latter, their numbers on the Pribyloffs are not great, in all between thirty and forty thousand. They are shy creatures, and, as Elliott remarks, on the slightest approach of man, a stampede into the water is the certain result.

Their voice is said to be a deep and grand roar, and when in mass has been likened to the howling of a tempest. The males come to these islands in the beginning of May, and the females a month later. The young are soon born, and at birth average twenty to twenty-five pounds, and two feet long, and then are of a dark chocolate-brown colour, with great watery grey-blue eyes. They shed their coat in October and become lighter, but do not precisely resemble their parents until they grow more adult.

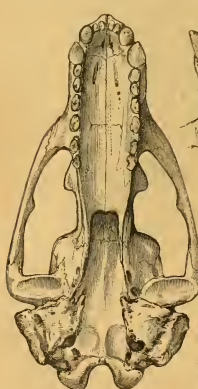
This animal being destitute of fur, its skin is of little value; but their hides, their fat, their flesh, their sinews, and intestines, are all useful to the Aleutian islanders. The last, the throat-linings, and the skin of the flippers, are tanned into excellent leather, and both waterproof coats and the natives' boots (*tarbosars*) are made out of them. Oil-vessels are made from the stomachs, the

sinews are used for threads for binding their skin-canoes, and to the flesh of this species there is given a decided preference

Steller's Sea Lion has a wider distribution, probably, than *O. ursina*, and stretches around Kamstchatka and the Asiatic coast to the Kurile Islands. Moreover, on the American coast as far as California they are occasionally met with. Indeed, one of the sights at San Francisco is the "Ocean House," a large hotel opposite the Seal Rocks at the mouth of the bay, whence a good view is obtained of a "rookery" of Sea Lions, now rigidly preserved by the American Government. They also inhabit the Farallone Islands about thirty miles from San Francisco.

The natives of Kamstchatka, to the coast of Siberia, capture the Sea Lions differently from the Pribyloff Islanders. In the summer months, Salmon swarm at the mouths of the rivers, the Seals following and preying on them. Strong wide-meshed nets, made of Seal-thong, are staked in a curve open to the confluence of the stream. The fish find a free passage, but the pursuing Seals become entangled, and the natives in flat-bottomed skin-boats approach and despatch the victims with rude bone implements. In the spring and fall they capture them on the floating ice, and during winter watch for their rising out of their breathing-holes to rest awhile, while the hunter deals destruction from behind a snow-bank or ice-cake. These natives convert the prepared hide for the Dog and Reindeer sledges and other purposes, and the blubber is a godsend.

Gilliespie's Hair Seal,* or Schlegel's Japanese Otary.—This animal also inhabits the bays and islands of the Californian coast, but the first good account of it came from the pen of Professor Schlegel, of Leyden, in his "Fauna Japonica," though, curiously enough, he confounded it with Steller's Sea Lion. It undoubtedly frequents the Japanese coasts, and, possibly, other spots in the North Pacific. Dr. Macbain, in describing a skull from California, showed its specific distinction. Indeed, from its having one pair less of upper molars, a narrow muzzle and facial profile, and great skull-crest, it has been placed by Gill and others in a separate genus (*Zalophus*). But as before indicated, we prefer to consider the whole of these Sea Lions as belonging to Otaria. The colour of this animal much resembles that of the last, or slightly more of a pale brownish-grey, underneath yellowish, but also darker in the limbs. The sexes approach each other in this respect. It is smaller in size than *O. Stelleri*, the largest known male being little over six feet long, and the female relatively smaller.



PALATE OF HOOKER'S SEA BEAR.

PALATE OF PATAGONIAN SEA LION.

Hooker's Sea Bear.†—Among the collection obtained during the eventful voyage, under Captain Sir J. C. Ross, in the *Erebus* and *Terror* to the Antarctic regions, were the skin and skeleton of a Sea Bear from the Auckland Islands, which Dr. Gray named after the celebrated botanist of the Expedition, Dr. (afterwards Sir) Joseph D. Hooker. No account of the life-history of the animal accompanied these remains, but the narrow skull, deeply concave palate-bones, and other osteological features, clearly showed its specific distinction. The precise geographical distribution of this Sea Bear there after became a knotty point, and from general outward resemblance of the Otary tribe one to the other it has been confounded with several of them. The investigations of Mr. J. W. Clark of Cambridge, however, set this at rest, and without enlarging into particulars, we shall briefly say that

* *Otaria Gilliespii.*

† *Otaria Hookeri*, the genus *Arctocephalus* and *Phocarctos* of Gray.

he has shown that besides the English voyagers, the French Expedition in the *Astrolabe* (1826–29), and Captain Thomas Musgrave (of whom I shall say something immediately), obtained it at the Aucklands. Moreover, the French, in their last Transit of Venus Expedition—to Campbell Islands—there met with it, and Mr. Clark identified it with a sub-fossil form found by Dr. Hector on the coast of New Zealand.

The original specimens of this Hair Seal in the British Museum are throughout of a darkish grey, inclining to yellow, or yellowish-brown, and what appears to be the male is about five feet long, while the female is smaller and yellower in colour.

The little that we know of the habits of this creature is chiefly derived from Captain Musgrave's extraordinary narrative, "Castaway on the Auckland Islands." In 1863, the schooner *Grafton*, of Sydney, was wrecked on the islands in question, where captain and crew were condemned to reside for twenty months. His journal of their sufferings on these desolate rocks was written in Seal's blood, and the editor of the gallant captain's narrative appropriately quotes worthy old Richard Hakluyt's words:—"How shall I admire your heroicke courage, ye marine worthies beyond all names of worthinesse!"

Before the distressed seamen had been a week on shore, the captain notes "that the Seals are very numerous here, and go roaring about the woods like wild cattle; indeed, we expect they will come and storm the tent some night." They found the sucklings delicious eating, exactly like lamb, but the flesh of the old males was rejected. Indeed, stewed, boiled, or roasted Seal's flesh and liver, with roots fried in oil, and occasionally mussels and fish, constituted dainties; for it happened at times they were driven to extremities for lack of fare. For a while a few crumbs of biscuit were regularly laid on the table, but only to look at, "or point at," as Paddy would say. On a single occasion they obtained the milk of a slain female, which they considered to be rich and good, and superior to Goats' milk. Needful of clothing, blankets, and shoes, by a rude manipulation with lye of ashes, drying and rubbing, and by tanning with bark, the skins were thus rendered available. Seals' tracks were found at the top of a mountain four miles from the water. They run fast in the bush, and where it is thick have an advantage over men, even climbing rocky cliffs and steep slippery banks almost inaccessible to the latter. Captain Musgrave believes their sense of smell to be very keen, but neither hearing nor sight acute on land. The old "bulls" have long, coarse, almost bristly fur on their neck and shoulders, which ruffles up when attacked, and this, with their great teeth, gives them rather a formidable leonine appearance. These "bulls" are savage, and so fierce that caution is required in facing them; they even are so bold as to leave the water and chase a man. One great and very old dark-coloured fellow, "king of a mob," was christened "Royal Tom," whose daring and dignity would barely allow him to move off when driven hard. On board the vessel which rescued the castaway survivors was a very large courageous Dog, which would fasten on the Otaries, but get dreadfully torn, and was no match in point of strength. Their tenacity of life is extraordinary. For instance, one received two bullets, had its head split open with an axe, and brain hanging out, but nevertheless dragged along the beach the men who were trying to keep him out of the water by hanging on his hind flippers. The males arrive in October, fat, choose ground, fight furiously, and remain until the end of February. The females go with young about eleven months, and bear a single offspring in February; but previous to parturition, in December and January, the smaller timid females wander in the bush bellowing in a dismal manner. The new-born young are black, become greyer after a few weeks, and when older brownish, the adult colouring following. Musgrave recounts the amusing manner in which the mother coaxes the young towards the water, which at first it is averse to enter, and she often displays ingenuity in getting it in. She puts it on her back, swims along gently, while the little bleating fellow slips or splutters off into the sea; the mother again gets underneath, or even becoming angry, gives it a cruel bite or slap with flipper. Ultimately, after such drilling, the youngsters take to the water of their own accord, and paddle about or play on shore in groups. There is a periodical migration of these Hooker's Sea Bears, but it is not so regular as in some other species, several remaining in the same quarters all the year round. They shift their camp, though, in the bays, and sleep ashore only at night. When in the water Captain Musgrave assures us their speed is very great, not exceeding twenty miles an hour, and they have a most extraordinary power of arresting their progress instantaneously.

White-necked Otary,* or Australian Sea Lion.—Under these two names, and those of the Counsellor Seal, the Cowled Seal, and Gray's Australian Hair Seal, has the Sea Lion been called which inhabits the shores of Australia. Two localities are specially noted—Houtman's Abrolhos and King George's Sound, on the west and south-western parts of the continent—though Mr. Scott mentions that this species was formerly very abundant in Bass's Strait, as also on the north-west coast of Australia, and that it is still found tolerably numerous on the Seal Rocks off Port Stephens, a short distance north of Sydney. Very old males of this animal are stated to attain a length of twelve feet, and to be as large in girth as a Horse, but adults from eight to nine feet long are more commonly met with, the females being still smaller. Mr. J. W. Clark deftly catches the salient points as follows:—"The adult has the face, front, and sides of the neck, all the under surface, sides, and back, dark or blackish-brown, passing into dark slaty grey on the extremities of the limbs; the hinder half of the crown, the nape and back of the neck, rich deep fawn-colour. It is the peculiar shape of this stripe of light colour stretching over head and neck which has given it the name of 'Cowled Seal,' and perhaps the appellation 'Counsellor Seal,' which I find is also applied to it, may have been suggested from a fancied resemblance to a barrister in his wig." The males and females differ in colour, the latter being lighter in tint. The white neck-spot, it is suggested, distinguishes the males. The "pups" are born black, and have an abundant coat of soft fur which diminishes with age, and in the old animal is entirely wanting. The skins, therefore, are of no great value, but as a commercial product the oil is of more importance.

The Patagonian Sea Lion,† or Cook's Otary.—Magellan, after whom the Strait dividing Tierra del Fuego from Patagonia is called, in his eventful voyage (1520) found, off the Rio de la Plata, what the Spaniards knew as a Sea Wolf (*Lobos de mar*), doubtless the Otary above named, for even in the present day the Government of Buenos Ayres protect the colony of Seals of one of the islands at which the celebrated navigator touched. Now these animals are scarce, and their range somewhat limited, but when the buccaneers carried fire and sword into the Spanish provinces they were of frequent occurrence, not only around Patagonia and the neighbouring islands, but up the Peruvian coast. Few of the voyagers that afterwards passed along these shores but had some slight adventure to relate concerning these creatures.

It was this animal that attracted the attention of Captain Cook and his naturalist, Forster, both describing it, the latter giving it the specific name of *jubata*, from the Latin *jubo* (a mane), a feature, however, that some naturalists of the present day are inclined to deny. But the fact is that at that date many exceedingly old, large, and rugged individuals of this species existed which are no longer to be met with.

Apart from the historical connections attaching to this creature, inasmuch as many famous voyagers' names have been associated with it, in our own generation it is remarkable as that first brought alive to England. The individual in question was latterly purchased by the Zoological Society, and died in their Gardens in 1867, in consequence of having swallowed a fish-hook among the food given to it. This notable animal created an interest in the Eared Seals (hitherto little studied) which since has led to the introduction of several living examples and of different species. To those who only knew the Seal tribe from the common sort, this Otaria seemed a marvel of docility, and at a glance most distinct in appearance, habits, and intelligence from anything heretofore exhibited. It was originally captured in the neighbourhood of Cape Horn, and François Lecomte, the French sailor into whose possession it fell, exhibited the animal for a short time in Buenos Ayres before bringing it to London, where for a time he earned a living by showing it off. By kindness and dint of training he taught it to become quite a performer in its way, mounting a ladder with perfect ease, and descending indifferently, head or tail foremost. It fired a small cannon, and went through several other performances indicative of the teachableness of its disposition and the successful assiduity of its trainer. From being cribbed, cabined, and confined, the animal, on its transference to the Zoological Gardens, was allowed the use of a spacious pond, and along with others of the Seal tribe exhibited greater freedom and naturalness of habit. So well known have its appearance and little tricks of mounting chairs, catching with open mouth fish thrown towards it, kissing its keeper, and so on, become, that it is needless to enter upon a detailed account of these matters. There is no doubt, however, that this animal, and

* *Otaria albicollis*, the *Neophoca lobata* of Gray. † *Otaria jubata*.

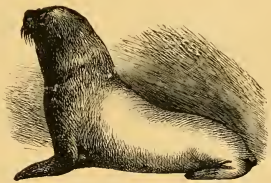
others of different species since shown at the Zoological Gardens, Brighton Aquarium, and elsewhere, have manifested traits of brain-power of a superior kind. One feature has struck all, namely, its voracity, twenty-five pounds of fish a day being barely more than short commons. If we estimate this

SEA LION DOZING ON HIS BACK.

SEA LION FAST ASLEEP.

amount to each individual, namely, an equivalent of 9,000 pounds a year, and remember that there exist colonies of these animals more than a million in number, the wonder arises that the finny tribe is not exterminated in those spots inhabited by the Seals.

SEA LION CLIMBING.



SEA LION IN WATCHFUL ATTITUDE.

The success accompanying the above animal's exhibition led to the Zoological Society's sending Lecomte to the Falklands to procure more. Although he obtained a number, most met mishaps and died before reaching London. His account of their habits and nature corroborates the earlier

SEA LION LICKING HIS LEG.

SEA LION SCRATCHING WITH HIND FOOT.

observers. According to him, families range from six to twenty, a dozen being the average, while a herd would be composed of several families. Located in the islands and isthmuses, an old male guards as sentinel, and signals, by a growl, approaching danger. Between sleeping and procuring food they

pass their time, often lying huddled in a drowsy condition. At high tides, night and day, they take to fishing near the entrance of fresh-water rivulets into the sea, at such times remaining for a whole tide dabbling after fish and crustaceans. In capturing their prey, they swallow it above or below the water. The animal at the Zoological Gardens, as a rule, came to the surface to swallow, but the other Seals more often did so underneath. This Otaria, Lecomte affirms, never drinks water, that which he first brought to England not receiving fluid for a year, but he had seen the Common Seals suck water like a Horse. He certified to the fact of their pebble-swallowing propensities. The general habits of this animal are but a repetition of what has been said of other species, and need not detain us. The greater number migrate towards the south from July till November, between these months remaining in the neighbourhood of the Falklands. The young are of a deep chocolate colour, when a year old becoming paler, the females being nearly grey, the old male of a rich brown hue, the flippers in all being darker. There is a sparse under-wool in the young, which sensibly diminishes with age.

Captain Cook says he met with immense males, twelve or fourteen feet in length, and eight or ten in circumference. Such big customers now no longer exist, though the truth of what the circumnavigator asserts would seem to be substantiated by the fact of skulls of enormous size being found hither and thither, weather-worn, on the beach. These exhibit the remarkable peculiarity of prodigious crests, so that they have been compared with the characteristic change shown in the Gorilla, to which allusion has already been made (Vol. I., p. 17).

THE FALKLAND ISLAND FUR SEAL.*—The head-quarters for the capture of this valuable species of commercial Fur Seal are the Falkland Isles, and the South Shetlands within the Antarctic Circle, but it is also found on the coast of South America, namely, around Patagonia, Cape Horn, and the islands bordering Chili. It doubtless also betakes itself to several of the small southern oceanic islets, such as the New Orkneys, South Georgia, and indeed very possibly migrates to the ice-bound areas surrounding the Southern Pole. Captain Abbott, who was formerly resident on the Falklands, says that Seal skins and Seal oil are two of the principal products of these islands. The boats employed in collecting these articles "are usually from twenty to thirty tons in measurement, and are manned by four or five men. They are sent out laden with provisions, casks for the oil, and salt for preserving the Seal skins; they are frequently out for months together, cruising about the islands, and seldom return without a full cargo." The favourite locality of this valuable Fur Seal at the Falklands is the Volunteer Rocks at the northern entrance to Berkeley Sound, these rocks, owing to the heavy swell, being inaccessible except in fine weather and after many days' calm. The truth is the hunters have driven these animals nearly away from their old quarters, the few that still remain being excessively shy. The best, almost classical account of the habits of this species, is that of Captain Weddell, in his "Voyage towards the South Pole," between 1818–1821. When he visited the South Shetlands, so little did they apprehend danger from man, that they lay quietly by while their neighbours were being killed and skinned. But, as he says, they soon acquired habits for counteracting danger, by placing themselves on rocks whence they precipitated themselves into the water. Their agility is very great, outstripping men running fast in pursuit. The absurd story of their throwing stones at their pursuers with their tails, Weddell accounts for by their awkward trailing gait, and in an attempt to scamper, scattering rocky fragments hither and thither behind them. He mentions their exceeding disproportion of size, the males, as in other species, being the more bulky, the latter being six to seven feet long, the females seldom more than four feet, and often less. He computed the females at about twenty to one male. They assemble gregariously on the coasts at different periods and in distinct classes. Like the Northern Fur Seals, the males separate and go ashore in November, where they await the arrival of the females. By December these latter begin to land, and the seraglio and system of battle resemble what has been described in the Fur Seal of the Pribyloff Islands. The period of gestation is about a twelvemonth, probably less, and the young are born in December. By the middle of February these latter, said to be taught to swim by their mothers, take to the water. At first they are black, a few weeks later become grey, and afterwards, as they frequent the sea, moult and acquire their peculiar furry coats. What the mariners call Dog Seals, that is, those a couple of years old, land in crowds as February terminates and March goes on. But by the end of April they once more make for the water, and scarcely land again until June wanes,

* *Otaria falklandica*, placed under the genus *Arctophoca* by Peters, and *Eutaria* by Gray.

FALKLAND ISLAND FUR SEAL.

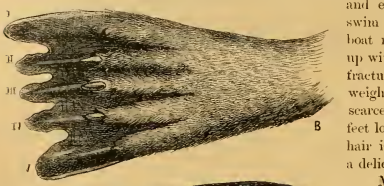
then they occupy irregularly the land and water for several weeks. Towards the close of August the herds of young Seals of both sexes again return on shore for a few weeks, and retire ultimately to the water, to be succeeded by the old and more powerful males, as above stated. Excepting the difference of season, their habits much resemble those of *O. ursinus*. As in the other Otaries, colour varies with age. The darker tint of the young, as they grow older, tones down to a rich brown, with the under parts yellow, the hairs being tipped with greyish-white. The hairs are by no means so strong as in the Hair Seals, while the under-fur is thick, soft, and of a ruddy brown hue. Their skins are among the most valuable in the market.

The South African, or Cape Fur Seal.*—We are still, as Mr. J. W. Clark remarked a few years ago, in a "lamentable state of ignorance about the Sea Lions of the Cape of Good Hope—indeed, we cannot say with certainty whether there are one or two species—though, from that centre of trade, cargoes of 60,000 or 70,000 skins come annually to the London market." In 1875, the Zoological Society obtained, presented through Sir Henry Barkly, a living specimen of Sea Lion, taken at the Cape, which was smaller in size than the Patagonian Sea Lion (*O. jubata*) exhibited along with it. This individual had a whitish-red coat, grizzled with blackish hairs, the under side of the body, as likewise the short fur, being of a richer reddish-brown. When it came out of the water, its then sleek skin closely resembled that of the latter well-known example of a Hair Seal. The process of dressing the skin we have already described, doubtless, would bring out the fact of its possessing the rich fur coat not obvious in the living animal. This would appear to agree with the barely adult stage of the animal. Flat skins, apparently of this same species from the Cape, figure largely in the trade sales, and those similar to the above in age are technically called "middlings." The smaller sorts of the sale catalogue, "pups," or "black pups," have smooth, soft, polished, black hairs more ruddy beneath. The large skins with a slight mane, the "large wigs" of the dealers, have whitish fur intermixed with black hairs and short reddish under-fur. The habits of the live animal in confinement quite resemble those of the other Sea Lions living alongside.

The New Zealand Fur Seal.†—The investigations of Mr. J. W. Clark ("Proceedings of the Zoological Society," 1875) tend to the conclusion that the Fur Seals originally met with by Captain Cook on the shores of New Zealand, and also by him and Flinders in Bass's Strait

* *Otaria pusilla*, the *Arctocephalus antarcticus* of Gray. † *Otaria Forsteri*, the *Gypsophoca tropicalis* of Gray.

and the coasts of Tasmania, belonged to one and the same species. J. R Forster, the naturalist who accompanied Cook, made some spirited sketches (now in the British Museum) of the living forms, which agree in most respects with animals obtained in 1871–5 by Dr. Hector in New Zealand. In 1773, during his second voyage of circumnavigation, Captain Cook cast anchor in Dusky Bay, New Zealand, and records that he saw great numbers of Seals on the small rocks and islets in this neighbourhood. Forster made careful notes thereon, besides his drawings. He says they are Seals with ears, hands free, feet webbed on the under surface, naked between the fingers, hardly nailed. Gregarious in habits, they are timid, and fling themselves off the rocks into the sea at the approach of man; but the most powerful resist when attacked, bite the weapons used against them, and even venture to assail the boats. They swim with such rapidity under water that a boat rowed by six strong men can scarcely keep up with them. Tenacious of life to a degree, a fractured skull did not despatch them. The weight of the full-grown is 220 lbs., of cubs scarcely 12 lbs.; the former are six or seven feet long, the latter barely two and a half. The hair is soft, black, with reddish-grey tips and a delicate reddish under-fur.



LEFT FORE (A) AND HIND (B) FLIPPER OF NEW ZEALAND FUR SEAL. (*After J. W. Clark.*)

Mr. Clark and Dr. Hector agree as to the general colour. The young are black when wet, when dry, lighter below; individual hairs pale yellow at base with light yellow tips, and a dense under-fur of the same tint. The older animals have hairs tipped with white. Round the mouth and ears are pale yellow. These Seals are fast disappearing or retiring to the Southern Antarctic Ocean. They possibly may be found in some of the smaller islands south of New Zealand, such as Auckland and Campbell Islands. On this point, however, information is required, but it has been shown at least that Hooker's Sea Bear frequents these latter, and, as already observed, is known in a sub-fossil state in New Zealand.

At the beginning of this century the sealing-trade of New South Wales was at its height, and vessels, manned by crews of from twenty-five to thirty men, pursued the craft. Mr. Scott, on the authority of Mr. Morris, an old Sydney sealer by profession, remarks that "to so great an extent was this indiscriminate killing carried, that in two years (1814–15) no less than 400,000 skins were obtained from Penantipod, or Antipodes Island, alone, and necessarily collected in so hasty a manner that very many of them were but imperfectly cured. The ship *Pegasus* took home 100,000 of these in bulk, and on her arrival in London, the skins, having heated during the voyage, had to be dug out of the hold, and were sold as manure—a sad and reckless waste of life."

THE ASH-COLOURED OTARY.*—It is to be regretted that a memoir on the Eared Seals from the pen of the admirable Péron was lost to science by his lamented early demise. The French *savant*, when sojourning on the South Australian coast at Kangaroo Island, found a new species of the genus, which he named *O. cinerea*, this attaining a length of nine to ten feet. He stated that the hair of this animal is very short, hard, and coarse, but its leather is thick and strong, and the oil prepared from its fat is as good as it is abundant and he recommends pursuit of it and the other Seals with fur of good quality.

Most likely it is the same animal to which Flinders alludes when he says, speaking of Kangaroo Island, which abounded with Kangaroos and Seals: "They seem to dwell mainly together. It not unfrequently happened that the report of a gun fired at a Kangaroo near the beach brought out two or three bellowing Seals from under the bushes considerably farther from the water-side. The

* *Otaria* (*Euotaria*) *cinerea*.

Seal, indeed, seems to be much the more discerning animal of the two; for its actions bespoke a knowledge of our not being Kangaroos, whereas the Kangaroo not unfrequently appeared to consider us to be Seals."

It evidently is to Péron's animal, or one otherwise not to be distinguished from it, that the naturalists of the *Astrolabe*, fully twenty years after, referred as the *Phoque cendrée* frequenting Port Western, Australia. This appears to be a distinct animal from others hitherto described, though so little is positively known that I shall merely draw attention to its colour. It is grey on the back, lighter on the muzzle, and rusty-grey on the lower parts of the body. It has sparse reddish under-fur, and Clark states of the somewhat dilapidated skin preserved in the Paris Museum that it has a length of between seven and eight feet.

CHAPTER III.

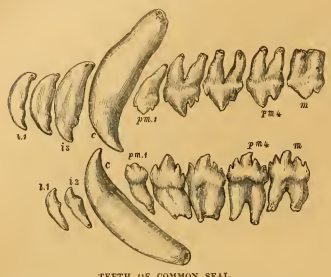
III.—THE EARLESS SEAL FAMILY (PHOCIDÆ).

General Characteristics—Peculiar Formation of the Hind Legs—Dentition—Swimming—THE COMMON SEAL—Range—Fight between a Seal and Salmon—Colour—Appearance—Annual Catch—Use of Skins in Greenland—Habits—THE RINGED SEAL—Appearance—Various Names—Odour—Flesh—Skin Clothes—Haunts—Modes of Capture—Range—THE GREENLAND, or SADDLEBACK SEAL—Habits—Appearance—Names—Range—Migrations—"Seals' Weddings"—Five Stages of Colour—Females—Weight—Seal Fisheries—Hunting—Implements of Slaughter—Various Operations—The Sealers—Oil, Skins, &c.—THE BEARDED SEAL—THE GREY SEAL—THE MONK SEAL—THE CRESTED OR BLADDER-NOSE SEAL—Range—Size—Ferocity—Character of the so-called Crest—Dentition—Colour—THE ELEPHANT SEAL—Peculiar Range—Proboscis—Scammon's Account—Habits—Hunting—Hardships of the Hunters—Recreations of the Men—Blubber, Oil, and Skins—Ross's LARGE-EYED SEAL—THE SEA LEOPARD—WEDDELL'S SEAL—THE CRAB-EATING SEAL—Concluding Remarks—The Slaughter of Seals—Remedies.

THOUGH the want of external ears is quite characteristic of this family, in contradistinction to the last, the fact of the Common Seals' limb-construction being such as to prevent them from using their four feet on land is a point of special importance. In the general shape of the body and the appearance of the skin they resemble the Sea Lions more than the Walrus. The fore limbs of the Phocidæ are relatively and absolutely shorter than in the Otariidæ. They are so attached to the body as to leave little else free than the hand. The nails are generally longish and claw-like, and the thumb does not so greatly exceed the other fingers as it does in the Otaries. It is on the hind legs that the main distinction is based. While the thigh-bones are uncommonly short, the leg-bones are relatively long, and directed backwards in a line with the spine, and closely bound to the tail by membrane as far as the heel itself. This mechanical arrangement prevents the leg from being thrown forwards, and therefore it is of no use in land progression. The hind feet accordingly mostly rest in a line with the axis of the body, and when spread out form a kind of broad pair of oars: or the soles approximated give a long rudder or fish-tail-like termination. The tail itself is quite conspicuous behind the heels. The outer or great toe, and the inner or little toe, are almost of equal length, the preponderance being in favour of the former, while the three middle toes are smaller in size, and the nails of all are claw-like. The head in general is rounder than that of the Otaries, the eye is much larger and

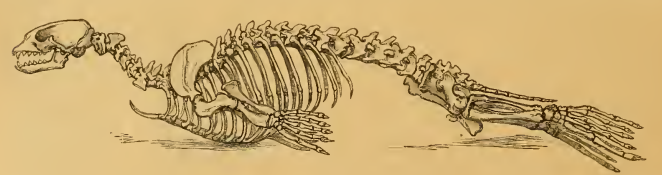
HIND FLIPPERS OF RINGED SEAL. (*Original after Murie.*)
A, opened out; B, closed.

the whiskers somewhat less profuse. Their brain is more spherical. In several minor particulars the skull differs from that of the Otaries, and especially in the dentition is there a marked difference. Three types prevail, of which the Common Seal, the Sea Leopards, and the Crested, or Hooded Seals, are examples. In the first, the dental formula is—Incisors, $\frac{3-3}{2-2}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; molars, $\frac{1-1}{1-1} = 34$. The differences in number and shape in the two others we shall notice in the context. With respect to the skeleton generally, bone for bone, the distinctions rather lie in their relative lengths and dimensions than in special difference of construction. The hip-bones, the hind leg-bones, and those of the fore feet, appreciably differ and correspond to the peculiarities of progression, &c., in the two groups. On land, this family (*Phocidæ*) lies on the belly, throws the hind feet back, and by a series of short jerking movements, so-called saltatory efforts, or a curious kind of dragging motion, grovels abdominally on the ground, the short fore-paws either pressed against the body, or, on rocky rougher ground, otherwise slightly aiding action. This movement of the Common Seal doubtless most people have witnessed, and it is quite unique not only amongst the Carnivora, but the whole of the Mammalia. In swimming, the Seals seldom use their fore feet, while the Otaries use them as powerful sweeps. On the other hand, in the Seals the hind limbs have a kind of sculling movement, comparable to a fish's tail, the sinuous strokes bearing some analogy to those of a screw-propeller. Less swift than the Otaries, they nevertheless move with extraordinary rapidity and power in the water.



TEETH OF COMMON SEAL.

In the last family, the Eared Seals, it was pointed out that they had a peculiar geographical distribution, wherein certain forms had alone a northern habitat, and similarly others pertained to a southern. Almost identically, the Earless Seals have northern and southern representatives, but the


SKELETON OF SEAL.

Elephant Seal ranges both north and south; and the Monk Seal, which, though properly speaking belonging to the northern area, inhabits a strip running east to west within the Temperate zone, indeed nearly approaching the Torrid. It is also worth mention that Van Beneden, Leidy, and others have described quite a number of sub-fossil species, and Phocine genera; though the data for the latter are by no means complete, and probably future researches will considerably modify the conclusions arrived at by these authors. These Seal remains have all been obtained in the Temperate parallel, and regions where the sea no longer flows. In referring to the Earless Seals, as in the case of the Otaries, we shall somewhat follow their geographical distribution.

The Common Seal.*—This most familiar species of the group is as ludicrous in its gait on land as it is surpassingly elegant in its movements in water. Its range is widespread, namely, the Black

* *Phoca vitulina*, the genus *Callocephalus* of some authorities.

Sea and the Mediterranean, and seaboard facing the Atlantic from Spain to Spitzbergen, from Florida along the American coast to Greenland, also near Iceland and Jan Mayen. It likewise abounds on the Scandinavian coasts, and in the Baltic, the British islands being favoured with many visitors. Being a shy, timid, though inquisitive animal, it now frequents the wild, lonely shores of Scotland and Ireland; but in former times even the Isle of Wight and the Cornish coast were famous for the number of their Seals. Still they sometimes visit river-mouths. For example, in 1877, between seventy and eighty large and small Seals, and of different colours, were seen sunning themselves on the sands at low tide at Abertay. Some of these must have gone up the river towards, or even beyond, Dundee, for at West Ferry a desperate and protracted fight between a Seal and a huge Salmon was witnessed, not far from the shore, by several parties. The encounter lasted for more than an hour, the Seal dashing wildly about after its equally agile prey. The Salmon was occasionally tossed into the air, after the fashion of a Cat with a Mouse. Spite of the exertions of the noble fish, it could not escape its pursuer, and at length becoming fairly exhausted, succumbed. The victor frequently rose to the surface with its quivering prey in its mouth ere finally feasting on crimped Salmon.

The Common Seal is of a yellowish-grey colour, spotted above with black and brown, so as to give a mottled appearance, while below it is of a whitish or silvery grey. Ordinarily the hairs are shining and stiff, the colour being dependent somewhat on their being moist or dry; when the former, dark grey predominates. In length it varies from three to six feet, the head being about a tenth part. The roundish head has a short muzzle, prominent whiskers, and large expressive eyes. The skull is distinguished by peculiarities in the shape of the palate and cheek-bones, and by the oblique position of the molar teeth.

Although as valuable as certain other forms hunted by the sealers, its numbers in the Polar regions are comparatively smaller, so that it is not separately pursued by them, though the Greenlanders have a high appreciation of its worth. Dr. R. Brown says the flesh is looked upon as the most palatable of all "Seal-beef," and he further remarks, "that no more acceptable present can be given to a Greenland damsel than a skin of the *Kassigiak*." Dr. Rink estimates their annual catch in Danish Greenland between 1,000 and 2,000, and he says that the skin is highly valued for making clothes. It is found all the year round on these coasts, though it more frequently dwells near the river-mouths, and hence has been called the Fresh-water Seal. It bears a variety of names, both local and in different countries, and also according to age. In Greenland the young are produced in June. The cub is at first pure white, a few days later becoming darker, and changing as age proceeds. Though very quiet in disposition it can take its own part when attacked, as the reader of Scott's "Antiquary" (Chapter xxx.) may remember, where Captain McIntyre's adventure with the *Phoca* is narrated with Sir Walter's usual graphic power. The same author's lines—

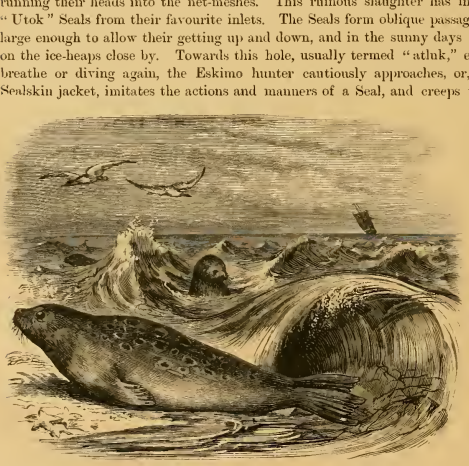
> "Rude Heiskar's Seals through surges dark
> Will long pursue the Minstrel's bark,"

are in reality no poet's licence, inasmuch as many instances are recorded of music—a flute, or even whistling, for example—bringing them to the surface. Their docility and intelligence are noted from the times of Pliny, and Professor Trail relates how one became a regular sociable kitchen pet. Of another, kept for six months in Shetland, the domesticity was quite marked. Called from a distance, even when in the sea, it would answer plaintively, swim ashore, and make its ungainly way over stones and grass to its lodge. This "Sealchie" amusing herself in the sea one day, a sudden snowstorm came on, during which some wild Seals approached and coaxed her off. A great number of interesting stories are related of the Common Seal, which *Phoque* lore, however, I need not stay to consider.

THE RINGED SEAL.*—This animal has considerable likeness to the last, excepting the fact that it is a very much smaller animal, seldom reaching more than three or four feet in length. It is blackish-grey above, the spotting being marked with oval whitish rings. Below, it is paler in colour, and its hair is softer and usually rougher than the Common Seal's. Besides these external features, the formation of the cheek and palate bones, and the straight line of the molar, distinguish it from *Ph. vitulina*. In addition to the above name, it is also called Fœtid and Fjord Seal. It is the

* *Phoca fœtida*, *or Phoca hispida*; the genus *Pagomys* of Gray.

"Neitsik" of the Greenlanders; "Floe Rat" of the sealers; and is known as "bodack," or "old man," in the Hebrides. Other popular names are given it in different countries. The callous Eskimo are not insensible to the disgusting odour exhaled from the old males, and hence the name *Fœtida*. Dr. Rink says that when the large fellows captured in the interior ice-fjords are brought into a hut, and cut up on its floor, a smell is emitted resembling something between that of assafœtida and onions. The flesh of the young, notwithstanding, both he and Dr. R. Brown aver, is sufficiently palatable to an educated taste; and the latter even states that after a time he and his companions became "quite epicurean connoisseurs in all the qualities, titbits, and dishes of the well-beloved Neitsik. The skin," he goes on to say, "forms the chief material of clothing in North Greenland. All of the οἱ πολλοί dress in Neitsik breeches and jumpers; and we sojourners from a far country soon encased ourselves in the somewhat *hispid*, but most comfortable, Neitsik nether garments. It is only high dignitaries like 'Herr Inspektor' that can afford such extravagance as a Kassigiak (*Ph. vitulina*) wardrobe! The Arctic *pelles* monopolise them all." The young are of white, though slightly yellowish tint, and the hair is curly. A favourite haunt of the Floe Rat is the great ice-fjord of Jakobshavn. They resort to the ice-floes in retired bays, seldom frequenting the open sea. Dr. Rink calculates that 51,000 are annually captured in Danish Greenland. On an average, he reckons their weight at about 84lbs. each. He says this Seal, which is also termed "Utok," is almost exclusively that captured by means of ice-nets. Two nets are used across the track of the Seals near shore, in certain sounds between 63° and 66° N. lat. One is lowered to the bottom, and over this the animals pass; the other intercepts them, and the former is hauled up, and they are then caught in immense numbers between the two, running their heads into the net-meshes. This ruinous slaughter has in many instances driven the "Utok" Seals from their favourite inlets. The Seals form oblique passages through the ice-crust only large enough to allow their getting up and down, and in the sunny days of May are fond of basking on the ice-heaps close by. Towards this hole, usually termed "atluk," equally adapted for rising to breathe or diving again, the Eskimo hunter cautiously approaches, or, covering his face with his Sealskin jacket, imitates the actions and manners of a Seal, and creeps towards his prey. In other cases, with a wooden frame, covered by white cotton, he pushes this shooting-sail slowly before him towards the animal. When sufficiently near, he despatches the creature with his gun, though it is necessary to inflict a severe wound in the skull or neck vertebræ, else the Seal quickly rolls down the hole and is lost. At other times, a couple of hunters will keep watch at the margin of an "atluk," and, while one is on the outlook for the animal's rising to breathe, the other plants his harpoon in the creature, the rope securing the victim. This method of hunting requires great patience, caution, and dexterity, for the acute sense of hearing keeps the animal always on the *qui vive*, and on perceiving the least mischievous stir it instantly escapes.



RINGED SEAL.

The geographical area of this species is round the southern coast of Greenland, Iceland, onwards to Spitzbergen, and high latitudes of the Arctic Ocean, towards Nova Zembla and the Russian coasts. It is also asserted that either this animal, or a closely-allied and barely-to-be-distinguished species,

is that which inhabits Lake Baikal, in North Central Asia, and Lake Ladoga, in Finland. On this head there is some discrepancy in the writings of authorities. M. Dybowski regards the Lake Baikal animal as distinct, and names it *Phoca baicalensis*. Nilsson again avers that the Seal of the Caspian Sea is a distinct species (*Phoca caspica*). On the other hand, Wallace and Van Beneden take a broader view, with which I am inclined to agree, that one, or more likely both, animals may be regarded as the Ringed Seal (*Phoca hispida*). It is very plausibly remarked that in former epochs of the world's history, as is well known, geologists show that a large area of what is now called Russia in Asia was partially submerged, or, at least, the lakes in question were in more direct communication with the Arctic Ocean. The Seals hence, one might say, had their oceanic connection cut off, and thus, on that account slightly modified, remain as evidence of a once different physical condition of the areas concerned.

ESKIMO HUNTERS AT AN ATLUK, WAITING FOR A SEAL.

THE GREENLAND, OR SADDLE-BACK SEAL.*—It is this species that forms one of the chief objects of chase both in the Spitzbergen and Newfoundland seas. In habits it agrees with the ordinary Seals though said to be careless and stupid, and easily captured. It feeds on small fish, crustacea, and mollusca. The males and females differ in appearance, and the changes from the younger to older stages are also very remarkable. Indeed, one may say scarcely two animals are alike. These peculiarities have given rise to a great variety of names—White Coats, Harp Seal, Blue Sides, and other common appellations—besides "Atak" of the Greenlanders, and "Karoleek" and "Neitke" of the Eskimo, &c.

It has a wide geographical range, namely, along the North American coast to Davis Strait, round Greenland, the Scandinavian coasts, the Arctic Ocean eastward to Behring Strait, and even to Kamstchatka. According to Rink, though migratory, it may nevertheless be considered at home on the Greenland coast, on account of its haunting the shore and running over the sounds and fjords during the greater part of the year. There it appears regularly along the southern coast in September, travelling in herds from south to north between the islands. They are then fat, but their blubber still increases towards winter. In October and November they are most numerous; in December they decrease, become scarce in January, and almost disappear in February. In May they return from southwards, and get more northerly in June, when they are very lean. The herds again disappear in July, and return in September. Thus the Saddle-back deserts the Greenland coast twice a year. As to their whereabouts during their absence, information is defective. In spring, early in March, and till the beginning of April, it is found in immense numbers in the proximity of the dreary island of Jan Mayen, and in the Spitzbergen waters, in a belt of ice which the sealers term "South-east pack." To these great broken ice-fields the Seals in vast numbers resort. At such times, as Dr. R. Brown observes, they may be seen, half a million and upwards, of both sexes, "literally covering the frozen waste as far as the eye can reach, with the aid of a telescope, from the crow's nest." At this season, the females give birth to their young—one, or occasionally two, in number. Then it is that the sealing-ships bear up towards the pack-ice; and, whenever

* *Phoca groenlandica*; the genus *Pagophilus* of Gray.

opportunity permits, after the young are but a few days old, land and commence their slaughter. As the young increase in strength and take to the water the female parents gradually leave them, and join the males, which have already gone north. In July flocks of Seals, termed by Scoresby "Seals' weddings," have been seen at times in the parallels of 76° and 77° N. lat. Opinions are at variance respecting the migration from the west coast of Greenland towards Spitzbergen, and eastwards; and Rink, at least, holds that the Seals of Baffin's Bay go in the spring down the west side of Davis Strait to Newfoundland and Labrador, where vast numbers are annually killed.

At birth the Saddle-backs are pure woolly white, this gradually assuming a yellowish tint when they take to the water a few weeks old. They then begin to change to a dark speckled, and afterwards a

SADDLE-BACKS ON THE ICE.

spotted hue, and are called "Hares" by the sealers. Next they become dark-bluish on the back, while the breast and belly are of a sombre silvery hue. They are now "blue-backs." Getting more spotted, the peculiar saddle-shaped band begins to form as they approach maturity. While in the fifth and last stage, the male acquires that well-developed half-moon-shaped mark on each side, the veritable saddle from which this Seal derives its vernacular name. An adult male is five or six feet long, the female seldom as much. The former is tawny-grey, or with a tinge of yellow or even reddish-brown in the spots, and marked by the saddle or lyre-shaped dorsal bands; hence also the cognomen of Harp Seal. The muzzle and head are dark. The adult female is dirty-white or tawny-bluish, or dark-grey on the back, with widely-distributed irregular spotting, but seldom or never shows the saddles.

Rink says a full-grown Saddle-back weighs about 250lbs., the skin and blubber over, and the flesh under, 100lbs. The winter blubber may amount to 80lbs., but in summer little more than a quarter of that. In Danish Greenland alone about 35,000 are captured annually. Its skin forms the useful covering of the "kayaks," or Eskimo canoes. The above number is, however, not a tithe of the enormous quantities of these creatures that are each year destroyed in the Greenland (*i.e.*, Spitzbergen), and Newfoundland Seal-fisheries. Of this important branch of British commerce it does not behove us to enter into detail, however interesting or appropriate to the subject. Suffice it to say, now chiefly from Dundee, a fleet of ships and powerful steamers built for the trade, proceed, at the end of February and the beginning of March, with a stoppage at the Shetlands to ship hardy seamen, to the pack-ice in the Arctic Sea. Heavy, dark, and dreary weather often awaits the mariners as they coast along the fields

of ice. Into the broken-up floes they now and again push their way, and as fortune wills it they may or may not discover from the mast-head a herd in the distance. Occasionally, even during the night, the noise of a family in these dismal regions will be heard, and the ship is soon made fast to the ice hard by, for the Seals during the breeding season frequent such areas of the ice as enable them to have easy access to the water. Then all becomes activity and excitement on board, every man having an interest and share in the expected plunder. The object is, if possible, to approach unperceived, surround, or get between the animals and the water, and, above all, to secure the young, which are more easily killed, and the more lawful prey. The sealers are provided with spiked clubs, sharp knives, seal-guns, and "ruer-ruddies," or ropes attached by broad belts over their shoulders. Watching their chance the men land in bands, approach cautiously, and commence their dreadful operations. The old Seals abide and guard their young, even endangering their own safety, and will raise themselves up, face, and severely bite the unwary hunter. Crack, crack go the guns, as the older animals endeavour to escape through the holes or towards the water. All and sundry are attacked; a blow of the club, or kick of a heavy sea-boot, despatches the young, while the more aged receive rougher usage ere they succumb. The work of murder goes on apace without stoppage, for once disturbed, no second chance may be allowed the hunter. Told off in batches, some of the men commence the work of skinning, and quickly turn out hide and blubber, throwing aside the (to them) useless carcass, while the skins are heaped in piles. Some collect these, fasten bundles by the rope, and drag them towards the boats, where other sailors are ready to receive them. Thus the murderous operation goes on while there is Seal to be killed, or weather permits the men to remain on the floe, for sometimes the latter will break up, a gale arise, and the poor fellows run even other untold risks. As for the personal appearance of the sealers, as they labour at the work of slaughter, they look the most ruffianly set of men in existence. They are dressed in the queerest caps and coats of various shapes, with smuggler-looking breeches and long boots; moustaches and beards are covered with a mass of frozen tobacco-juice, hoar-frost, and Seal's blood. Their matted hair, gory, greasy, unwashed faces and hands, reek and smell with a strong taint of butchery. In truth, a spectator, seeing the lot, might almost fancy himself back amongst some of the old bloodthirsty pirates of the Spanish Main. However, they work very hard for their hire. The hides are dropped pell-mell into the hold, and as soon as suiting time arrives, the blubber is sliced off, the skins roughly salted, and in this condition the material is retained for the few weeks until their voyage leads the "fishers" home again. Arrived at Dundee, the cargo is quickly landed, weighed, and the materials placed in the hands of the skinner. The fat is cut up by a variety of cutters driven by steam, and then steamed to facilitate the rendering of the oil. The greater part of the oil thus obtained is tasteless, inodorous, and pure as water. The remaining blubber, after the first oil is taken off, is placed in bags and pressed, and from these pressings most of the brown and inferior quality of oil is had. The former is by far the more valuable. Seal-oil has, of course, varied considerably in price during this century, in 1876–7 averaging £32 a ton, the inferior sort less in proportion. With regard to the skins, these, after being soaked, and the salt got rid of, pass through the usual tanning processes. Relative absence of under-fur gives value only to the leather. Roughly speaking, they fetch five to six shillings apiece.

THE BEARDED SEAL.*—About this animal there seems to be a certain amount of ambiguity, or want of agreement among naturalists, whether more than one species be not included under the *Ph. barbata* of Fabricius. This missionary refers to the "Ursuk," the big, fat, or great Seal of the Greenlanders. The Russian naturalists Steller, Pallas, and Middendorf, speak of a Seal by different appellations, but most evidently this animal, as inhabiting the neighbourhood of Behring Strait and Kamtschatka. Schrenck and Temminck refer to it as being found, the former on the coast of Amoor land, the latter in Japan, where its skin is sold as an article of commerce. The Leporine Seal of Pennant may be regarded as still another synonym of the same creature. If such be the case, this great Bearded Seal has a geographical range from the west of Greenland to the Sea of Japan, an area somewhat corresponding to that of the Saddle-back, though less spread in the North Atlantic. Rink alludes to it as the "Thong Seal," the Eskimo cutting the skin circularly into a long strip, which "allunak," or hide rope, they use for harpoon lines. About 1,000 are captured annually off the Greenland coast." Dr. R. Brown regards it as the "Ground Seal" of the Spitzbergen sealers, and says the blubber is most

* *Phoca barbata.*

delicate in taste, and most highly prized as a culinary dainty. Unlike the other Seals, it has no "atluk," but depends on broken places in the ice. It is generally found among loose ice and breaking-up floes. Its great size, occasionally ten feet long, and bulky body in proportion, is its important feature. It is of a tawny colour, darker above, and the young is supposed to be of a lighter hue.

THE GREY SEAL.*—Its range is a limited one compared with that of the last. It frequents the British coasts, especially Ireland and the Hebrides, and from the Scandinavian coast it stretches towards and round the southern shore of Greenland. It also is of enormous size. One old male, shot in 1869, at the Eagle Rock, Connemara, Mr. A. G. More states, weighed nearly 400lbs., was eight feet long, and had a girth of body over five feet. Its colour is yellowish-grey, lighter beneath, with varied dark grey spots and blotches. Fabricius first described it, and the Swede Professor Nilsson ranked it as a separate genus, the distinguishing characters depending on the form of its skull and molar teeth, small brain-case, and large nasal orifice, the muzzle being deep and obliquely truncated. To Mr. Ball, of Dublin, we are indebted for a tolerably good account of its habits and other particulars, he having shown it to be the same as Donovan's Orkney Seal, the so-called *Ph. barbata*. In bringing the matter before the British Association in 1836, Professor Nilsson recognised it as his *H. griseus*, the same animal described by Fabricius in 1790. On the British coasts it breeds in October and November, though Nilsson asserts that on the Swedish coasts it breeds in February, a contradiction hitherto not clearly explained. A male and female from Wales were exhibited in the Zoological Gardens in 1871, and Mr. Bartlett particularly noted that it was both greedy and savage as compared with the other Seals under his charge. This accords with Mr. Ball's account, who found it insusceptible of domestication; this he attributed to its small brain relatively to the other Seals. At the mouth of a cave at Howth he was fortunate in harpooning one. Some state that they are solitary in their habits, others that they associate in pairs, and still others that they congregate in groups of ten or a dozen. At all events, they select such remote and unfrequented situations that it is no very easy matter to follow them. They are not so lively, watchful, or timid as the Common Seal. Those of the county Galway are said to utter most dismal howls in chorus. Their young they leave on the exposed barren rocks, and suckle them every tide for the space of a fortnight. When born, they are of a dull yellowish-white, in a few weeks becoming darker, and by degrees gaining their greyish coat. Under the name of Black Seal, probably this species, an animal (besides the Common Seal) occasionally frequents the Bay of St. Andrews and the Tay mouth, where it is very destructive to fish and nets.

THE MONK SEAL.†—Who has not heard or seen something of the "wonderful learned talking fish," if only from placard or fanciful sketch hung outside the showman's caravan, with the occasional attractive announcement that "the amphibious creature has the sense of hearing in its nostrils, and fins bearing the impression of five fingers?" A visit soon dispels the illusion, as the imploring look of a hungry but bright-eyed Seal in a tub of water greets the sight. These "talking fish" generally belong to this species, and have often been exhibited in Britain and on the Continent. A full-grown animal reaches between seven and eight feet long, and upwards. It is dark-brown mixed with grey above, and whitish below, and has short hair and small claws. It entirely differs from all the preceding in being confined to the Mediterranean and Black Seas, and the African coasts neighbouring Madeira and the Canaries. Buffon's classic description of the White-bellied Seal refers to this species, and Pennant names it the Pied Seal. Its geographical limits are as above stated, unless it be the same as a Seal from Jamaica, which Gray terms *M. tropicalis*, in which case it would traverse the Atlantic, a fact that is more than doubtful. Their mild disposition and teachable nature have led to their frequent exhibition. They go through many tricks, utter sounds construed into speech, present the fore-paw to "shake hands," kiss the visitor when desired, obey other trifling commands, and allow themselves to be freely handled. Little is known as to its times of breeding and rearing of young, though its habits in a state of nature are believed to be very similar to those of the Seal tribe generally.

THE CRESTED, OR BLADDER-NOSE SEAL.‡—The geographical range of this animal agrees best with that of the Common Seal, that is, it sweeps along the North American coast from Florida right up into Baffin's Bay, thence to the south coasts of Greenland, across the North Atlantic, skirting Britain and Scandinavia, to Spitzbergen. Named from the remarkable prominence of the front upper part of the head, this is one of the largest and most powerful of the Northern Seals. Certainly it

* *Halichœrus gryphus.* † *Monachus albiventer.* ‡ *Cystophora cristata.*

is the fiercest and most dangerous, as the Eskimo know to their cost in attacking it from their kayaks. It does not hesitate to return an assault, and the crest, it is said, affords some protection from wounds inflicted by the club. These brutes fight ferociously among themselves, and the roaring during such ice-battles, in the still Arctic regions, is said to be audible four miles off. The so-called crest, hood, or bladder, is in reality nothing of the sort, but only a peculiar enlargement of the nasal passages, more particularly developed in the old animals of both sexes. The configuration of the head of this creature is hemispherical, and proportionally broad and short. The bony parts of the snout, and the cartilaginous septum of the nose and nostrils generally, are so formed as to allow great dilatation of these parts. That is to say, the two passages of the nostrils are, in the full-grown animal, exceedingly capacious fleshy tunnels

CRESTED SEAL.

From youth onwards, this region acquires prominence, and, partly through habit and growth of the structures in later life, the animal when roused inflates, by compression of the muscles of upper-lip and nose, the cavities in question, so much so as to produce the expansion on the forehead which has given rise to its specific *sonbriquet*. All engravings, even our own, represent this structure as reaching farther back on the head than the absolute anatomical conformation of the parts warrants, but in the live animal the skin of the head rearwards to some extent swells in unison with the puffed nostril, and hence to a certain degree simulates a hood or crest. Some sealers regard the so-called bladder as an air reservoir for buoyancy, an idea totally at variance with its true nature. The teeth of this genus are peculiar, the incisors being fewer in number. The formula is—Incisors, $\frac{2-2}{1-1}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{4-4}{4-4}$; mo'ars, $\frac{1-1}{1-1}$=30. From eight to twelve feet in length has been given as the limits of size it obtains. The young are pure white; when a year old they become greyish, and the hue deepens, becoming deep chestnut and black above, though the lighter shade is retained on the under parts; chiefly

on the back are black spots and rings of white. The muzzle is hairy, and the hair on the rest of the body long, with thick soft under-wool. It visits Greenland in May and June, leaves in July, and again returns in August and September. Fabricius states that they are polygamous. This animal is one which the sealers hunt, it frequenting the outside of the ice-packs. Rink estimates the average annual catch in Greenland at 3,000. An individual will yield 120 lbs. of blubber, and as much as 200 lbs. of flesh.

TEETH OF THE CRESTED SEAL.

THE ELEPHANT SEAL.*—This creature, like the last, has a peculiar geographical range, but is unique, inasmuch as it is found north and south of the equator. It should, however, be stated that Dr. Gill has designated the northern form by a separate name (*Macrorhinus angustirostris*), though the distinctive characters have as yet not been substantiated by other naturalists. Meantime, we may be justified in regarding them as one form. It existed formerly in numbers on the Californian coast. But it is best known as frequenting, during the beginning of this century, such islands as Juan Fernandez, the Falklands, New Georgia, South Shetlands, Tristan d'Acunha, Kerguelen's Land, and, indeed, several of the islands scattered in the Antarctic Ocean. In the young and females, the characteristic feature, or so-called proboscis, is deficient, but in the old males it extends quite a foot beyond the angle of the mouth, and hence the name of Elephant Seal. The females are nine or ten feet, the males fourteen, sixteen, and even twenty feet in length. The colour varies with age from brown to leaden-grey. It seems that they bring forth their young at different seasons in the southern and northern latitudes, in the latter about May or June, in the former somewhat earlier. Accounts differ as to its food, some saying cuttle-fish and seaweed are its principal nutriment.

Lord Anson, Captain Cook, and M. Péron, each give accounts respecting its extraordinary abundance in southern regions, but their numbers have since been decimated. Captain Scammon describes them as crawling out of the surf towards the ravines half a mile distant from the water, where they congregated in hundreds. Unless when excited, their movement on land is slower than that of the ordinary Seals, but they ascend broken elevated ground fifty or sixty feet above the sea. He says that when sailors are destitute of tobacco-pipes, they hollow its short canine teeth into bowls and use the quills of the Pelican for shanks. Their hunting in Desolation and Herd's Islands is a most exposed and solitary pursuit. The ship is manned with a double crew, and some of the men are landed on the dangerous, ever-stormy coasts of these islands. Food and necessaries are provided, and rude shanties erected of rough boards, tarred canvas, and pieces of lava-rock. In this dank habitation, planted between an iceberg on the one side and a bluff volcanic mountain on the other, they are left to hunt as best they can, in a climate windy, rainy, cold, and often snowy. Nevertheless, undergoing hardships and privations of no common kind, excitement and prospect of gain compensate for their fatigues and temporary banishment. By the flickerings of a murky oil lamp, and fat and coal diffusing heat, these reckless adventurers pass the long, dreary, cold, evenings in card-playing and boisterous fun. Sea Elephants' tongues and water-fowl are gladly intermingled with coarser fare. The men divide themselves into groups, and scour the coast in all directions, killing such numbers as fall in their way. They either transport the blubber and skins to their stores, or bury it for a time until opportunity of its removal is afforded. Afterwards it is placed in casks, and these are rolled by the gangs to the beach, when their vessel arrives. The casks are then launched into the surf, pulled through the rollers by the boats to the ship, where they are duly stowed. In the Californian district, the skin of the animal is ripped up along the back and reflected; the blubber is cut into "*horse-pieces*," about a foot square, and a hole made through which a rope is passed. The pieces are again strung on a raft-rope, a line is made fast to this, when they are dragged

* *Macrorhinus elephantinus*; the genus *Morunga* of Gray.

ELEPHANT SEAL.

through the breakers to the small boat, and towed to the vessel. On board, large pots set in a brick furnace are ready prepared, where the blubber is rendered, the oil extracted being very superior for lubricating purposes. In these voyages the crews, unlike the Dundee fishers, hunt both Seals and Whales at the same time, the Americans having quite a monopoly of this special trade.

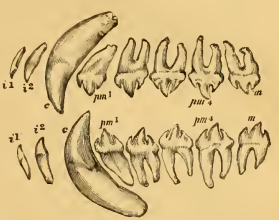
Ross's Large-eyed Seal.*—In the voyage of the *Erebus* and *Terror* to the Antarctic regions, 1839–43, there was obtained a Seal named after the commander of the Expedition. Little or nothing is recorded of its special habitat and habits, the main peculiarities resting in its skeleton. The stuffed skin, now in the British Museum, is of a greenish-yellow colour, with close, oblique, yellow stripes on the side, pale beneath, and the fur is close-set and rigid. The skull is broad, with great orbits. This genus has six molar teeth on each side of the upper and five on each side of the lower jaw. The canines are of very moderate dimensions, and the teeth, as a whole, are relatively small. Its specific name is derived from its great eyes.

The Sea Leopard.†—Under the names Sea Leopard and Leopard Seal, indiscriminately used by the sailors or Southern sealers, two animals, apparently distinct, have evidently been confounded by them as well as by naturalists. Indeed, another seemingly totally different animal of the North Pacific has also been named Leopard Seal by Scammon. That to which the title Sea Leopard appears most applicable is what De Blainville and others called the Small-nailed Seal (*Phoca leptonyx*), and F. Cuvier the Narrow-muzzled Seal (*Stenorhynchus leptonyx*). Its precise distribution is uncertain, but it has been found on the coasts of Australia, New Zealand, Falkland, Campbell, Auckland, and Lord Howe's Islands, and the Antarctic Ocean (on pack-ice). It may possibly be met with elsewhere, but the foregoing are authenticated localities. Mr. A. W. Scott describes male and female stuffed specimens in the Sydney Museum. The old male measures twelve feet in length; the glossy spotted skin is of a light silvery grey, with pale yellowish-white in patches, brought into relief by black-grey shading; its back and sides are darker, and belly lighter. The younger but adult female is seven feet long. Her colour above is darkish-grey, almost black in the middle line, intermixed by narrow markings of darker hue, and of yellowish-white, and the under parts without spots and also yellowish-white. A specimen kept alive for several days at Port Jackson had a long muzzle, a long thin neck, and in its habits generally it resembled the Seal tribe. Dr. George Bennett killed a male in Shoalhaven River (August, 1859), several miles above salt-water reach, which had a water-mole in its stomach. Dr. Knox states that those he examined in New Zealand contained in their stomachs fish-bones, gulls' feathers,

* *Ommatophoca Rossii.* † *Stenorhynchus leptonyx.*

SEA LEOPARD SEALS.

and seaweeds. Captain Musgrave, in his forced residence on the Aucklands, already referred to, alludes to this animal as the Black Seal, and describes a fight between one and a Sea Lion (*Otaria*); the flesh, he says, is rank. So far as his observations go, they remain at these islands pretty nearly all the year round, but others think that they occasionally migrate, or, at least, at certain seasons less frequently approach the land. The skull is remarkably elongated; the double-rooted molar teeth are compressed and serrate, or have a three-lobed crown, the middle being the longest. This animal has but four incisors above and four below, and the canines are of moderate dimensions. The nails on the hind feet are almost absent.



TEETH OF THE SEA LEOPARD.

WEDDELL'S SEAL.*—A couple of stuffed specimens and a few skulls of this Seal in the British Museum, and a stuffed specimen in Edinburgh, are the sole material on which this species is founded. Dr. R. Hamilton, in the "Naturalist's Library," described the latter as the Leopard Seal (*Phoca leopardina*, Jameson). Captain Weddell had brought it from the Southern Orkneys, and, according to him, during life the animal is pale greyish above, yellowish beneath, and the back spotted with pale white. Dr. Gray mentions the London male specimen as fulvous, with a blackish-grey line down the back, the female and young corresponding to Captain Weddell's description. The distinction between this and the last species is barely appreciable from their external coat, such differences as exist being in the skull. Weddell's Seal, or, as Gray names it, the False Sea Leopard (*Leptonyx Weddellii*), has a relatively shorter and broader skull, fuller in the brain-pan, largish orbits, and a weak lower jaw. The molars are not tri-cusped; the front one in each jaw is single-rooted, and the rest double-rooted. The Antarctic Expedition brought home skulls, and skins and skulls were afterwards obtained by Captain Fitzroy, R.N., from the River Santa Cruz, Patagonia. Neither they nor Weddell give us any information respecting the life-habits of this animal. It will thus be seen that its geographical area, and especially its geographical relations towards the previous species, are at present uncertain. On account of the peculiarities of cranium and dentition, Gray forms it into a separate genus.

THE CRAB-EATING SEAL, OR SAW-TOOTH STERRINCK OF OWEN.†—The interest in this creature lies probably not so much in the nature of its food as in the greater saw-like character of its molars, which strongly resemble those of the fossil Zeuglodon, an animal of the Whale tribe. The Crab-eating Seal inhabits an undefined area of the Antarctic Seas. Above it is of a nearly uniform olive colour, below and the sides of the face yellowish-white, and there are a few often confluent spots of a light colour on the flanks. The five-toed fore feet, whose wrist is said to be very short, are clawed, but the hind ones are clawless. In number, the teeth agree with the Sea Leopard's; though the first, second, and third front upper and the first front lower molars are single-rooted, the rest double-rooted. Moreover, nearly all the molar teeth have two or three cusps behind the middle strong conical lobe, while in front there is usually only a single small conical elevation. Thus the hinder border of these molars is considerably more saw-like than in the Sea Leopard. It differs also from the latter both in the lower jaw and upper parts of the cranium, but more particularly in the nasal and facial regions. Little is known with regard to its life-history.

The last three Seals some have considered under three distinct generic names, for reasons already given. If importance be attached to the dentition, this separation is allowable; but on the other hand there are considerable resemblances which others regard as only of specific weight. The generic term *Stenorhynchus*, first used by F. Cuvier in 1824 for the so-called Sea Leopard, and which has been at times indiscriminately applied by different naturalists to all three animals with multi-serrate crowned teeth, but here partially restricted to the first two, is a name well known and still applicable to one or other. Nevertheless, Lamarck, in 1819, had designated a genus of Crabs

* *Stenorhynchus (Leptonyx) Weddellii.* † *Lobodon carcinophaga.*

Stenorhynchus, universally accepted, and also in current use up to the present time. Some confusion having thus occasionally resulted, Professor Peters drew attention to the awkwardness of the circumstance, and proposed that the term *Oymorhinus* should replace *Stenorhynchus*, as applied to the Seals; Lamarck's name having priority being retained for the Crabs. This well exemplifies one among the many difficulties and cross-purposes incident to nomenclature, &c., of Natural History, where, in the vast array of names and facts presented, glaring discrepancies will arise, despite the constant revision of those devoted to its study.

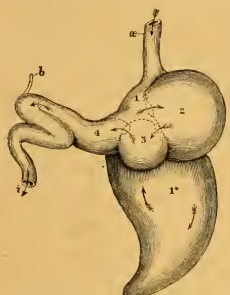
Before closing this chapter, there is one subject which I believe deserves mention, however briefly. The enormous slaughter of the Seal tribe is a matter of serious consideration, if only in a mercantile spirit. Among the sealers, neither sex nor age is spared, and therefore at the present wholesale rate of destruction it is easy to foresee early comparative, if not absolute, extinction of the tribe. Nothing can be clearer than the fact that since the Americans in their Alaska territory have adopted the plan of killing a prescribed number annually of the young and male Seals only, in other words, of protecting the breeding females, the Fur Seals have shown no tendency to diminution, but rather an apparent increase. Nature has her limits, and the Seals have other enemies to contend with besides man. Yet the latter, taking advantage of the maternal affections, and with the aid of deadly firearms and the like, in a certain space of time commits more fatal havoc among them than all their other foes combined. Several persons have urged a close-time. The fact is there are great difficulties in the way of this, for even in well-protected British rivers and fisheries generally, Salmon and others of the finny tribe are caught at forbidden times, in spite of Acts of Parliament and other regulations. Who is to watch the sealers in far-off inhospitable climes? Certainly in the Northern sealing-grounds the departure of the ships could be made somewhat later, as has, indeed, to some extent been done, but of course at the risk of a diminished catch. In the long run beneficial results doubtless will follow. But the plan most applicable to both Northern and Southern Seal-capture would be the insistance of the simple rule of *sparing the breeding females whenever possible*. If our merchants at home would take the matter in hand, and, but for a few years, refuse to receive female skins, the sealers would be practically forced, and in fact find it to their benefit, to look to their interests from a more humane point of view.

JAMES MURIE.

ORDER CETACEA.—WHALES.

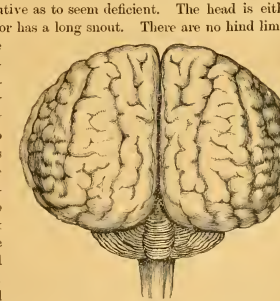
Whales—Vulgar Notions—Characteristics External and Internal—Larynx—Tail—Skeleton—Classification—THE TOOTHED WHALES—Zeuglodons—Squalodons—Phocodons—River Dolphins—Susu, or Gangetic Dolphin—Description—Habits—Teeth—Inia—Pontoporia—Ziphioid Whales—Cuvier's Whale—Van Beneden's Whale—Sowerby's Whale—New Zealand Berardius—Bottlehead, or Common Beaked Whale—Sperm Whales, or Cachalots—Sperm Whale—Description—Range—Fishery—Incidents of the Chase—Habits—Harpooned—Treatment of the Carcass—Short-headed Whale, or Snub-nosed Cachalot—Dolphins—Caaing, or Pilot Whale—Risso's Grampus—Common Porpoise—Killer Whale, or Orca—Ferocity—True Dolphins—Common Dolphin—Bottle-nose Dolphin—White Whale—Narwhal—THE WHALEBONE WHALES—Whalebone—Greenland, or Right Whale—Biscay Whale—Japan Whale—Cape Whale—South Pacific Whale—Description of the Greenland Whale—Their Food and Mode of Feeding—Habits—Hunting—Treatment of Carcass—Hump-backed Whales—Fin Whales, or Rorquals—Sibbald's Rorqual—Sulphur-bottom Whale—Common Rorqual, or Razor-back—Lesser Rorqual—Concluding Remarks.

The Whales form one of the most extraordinary groups of the Mammalia, for they are warm-blooded, air-breathers, and sucklers of their young, and are most strangely adapted for life in a watery element. Oddly enough the term "Fish" is still applied to them by the whalers, though they have nothing in common with these creatures save a certain similitude in shape. The vulgar notion of a Whale is an enormous creature with an extremely capacious mouth, but the fact is that many of the Cetacea are of relatively moderate dimensions, though doubtless, on the other hand, the magnitude of some is perfectly amazing. Thus, in size they are variable as a group, a range of from five or six feet (equal to the stature of man) to seventy or eighty feet giving sufficiently wide limits. With certain exceptions, notwithstanding length, an average-sized Whale by no means conveys to the eye the same idea of vastness, say for instance, as does an Elephant. The reason is that most Cetaceans are of a club shape, the compact cylindrical body and long narrow tapering tail reducing the idea of size. The head is in such continuity with the body that of neck there seems nothing. In some there are upright fleshy back fins; in others these are wanting. The gristly caudal fin is horizontal and not upright or rayed like a fish's. The body is smooth and devoid of hair. The eye is remarkably small and without eyelashes, and the ear orifice is so diminutive as to seem deficient. The head is either rounded, massive, or has a long snout. There are no hind limbs,



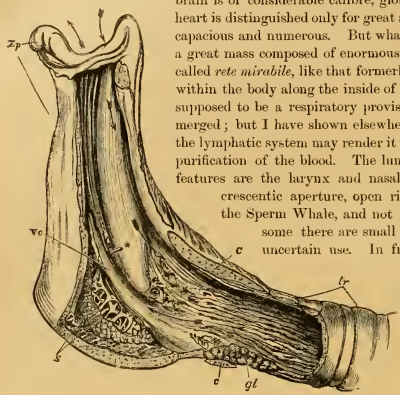
STOMACH OF PILOT WHALE. (*After Murie.*)
a, œsophagus, or gullet; *b*, bile duct; *i*, intestine; 1, 1*, 2, 2*, 3, 4, represent the various chambers, the arrows denoting the direction food takes in passing onwards.

and only in the enormous Whalebone Whales have the rudiments of any been found. Small pelvic bones, however, are present, embedded in the flesh at the setting-on of the tail. The fore-limbs, which are ordinarily termed flippers, have the usual bones extremely broadened and flattened; the free part—equivalent to the hand—being encased in a rigid or stiff nailless membrane; and in a few instances the phalanges are exceedingly numerous, producing a long-fingered peculiarity met with in no other Mammal. The two mammæ adjoin the pelvic bones, the nipples being sunk in slits. In one section only, the Mysticete, is the mouth very large. In them great plates of the so-called whalebone, a horny substance, occupy the place of teeth. In another section, the Denticete, with moderate-sized mouth, teeth are present in few or greater numbers. These are implanted in simple sockets without successors —*i.e.*, there is no milk and adult dentition as in the foregoing orders. The tongue cannot be thrust



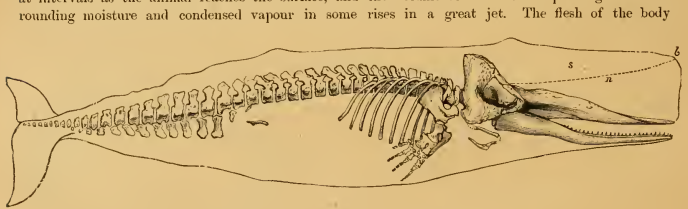
UPPER SURFACE OF THE BRAIN OF THE PORPOISE. (*After Leuret and Gratiolet.*)

out. The gullet is narrow in some, and wider in others, but the stomach in all is peculiar, and composed of three or more chambers with narrow passages between; in this respect corresponding to that of Sheep and cattle. The intestines are long, glandular, and full of little pouches. There is no gall-bladder. The brain is of considerable calibre, globular, and remarkably convoluted. The heart is distinguished only for great size, and the blood vessels are exceedingly capacious and numerous. But what is remarkable in the vascular system is a great mass composed of enormous numbers of minute tubes, forming a so-called *rete mirabile*, like that formerly described in the Lemurs. It is situated within the body along the inside of the spine. This, in the Whales, has been supposed to be a respiratory provision to enable them to remain long submerged; but I have shown elsewhere that its connection with the glands of the lymphatic system may render it functionally subservient to nutrition and purification of the blood. The lungs are large, but the most extraordinary features are the larynx and nasal passages. The nostrils, often a single crescentic aperture, open right on the top of the head, except in the Sperm Whale, and not in front as in all other Mammalia. In some there are small pouches near the orifice or blowhole of uncertain use. In front of the larynx of man we all know there is an elastic lid, the epiglottis, which folds over and protects the air-passage as food is swallowed. The side cartilages constitute the walls of the organ of voice, and protect the vocal cords. Now, in the comparatively voiceless Whale the cartilages including the epiglottis form a long rigid cylindrical tube which is thrust up the passage at the back of the palate in continuity with the blowhole. It is there held in place by a muscular ring. With the larynx thus retained bolt upright, and the blowhole meanwhile being compressed or closed, the Cetacean is enabled to swallow food under water without the latter entering the lungs. Respiration, "blowing" or "spouting," takes place at intervals as the animal reaches the surface, and the volume of air thrown up along with surrounding moisture and condensed vapour in some rises in a great jet. The flesh of the body



INTERIOR VIEW OF LARYNX OF RISSO'S GRAMPUS. (*After Murie.*)

Ep, epiglottis; *vc*, vocal cord; *s*, sac; *c*, cartilage; *gl*, gland; *tr*, trachea. The arrows show direction of air-currents in ingress and egress.



SKELETON OF SPERM WHALE. (*After Flower.*)

s, Spermaceti Cavity; *n*, Nasal Passage, in dotted line; *b*, Blowhole.

terminates in long cords of tendon running to the tip of the tail. These tendons, like a telegraphic cable, bound together in the smallest compass, are moved by the enormous fleshy masses of the body, and thus their vast force is conveyed to the caudal appendage, whose great power as a propelling agent (and even a destructive one) enables the Whales to be truly roamers of the sea. Save the tail and flippers, the body is covered by a dense layer of fat, the blubber. In the skeleton the neck-bones are often soldered into one or two separate pieces, rigidity being needful in front, while the

remaining vertebræ, tapering to exceedingly small bones in the tail, are each separated by thick elastic fibro-cartilaginous cushions, thus giving great flexibility behind. The breast-bone is often in a single flat piece. The skull is greatly modified and by no means uniform throughout the group. Among the Dolphins and others (Delphinidæ) it is strangely distorted, so that the one side does not agree with the other. The upper jaw-bones (*maxillæ*) and the pair of bones above and between them (*premaxillæ*) are unusually produced, and this production in front, with corresponding extension of lower jaw, gives a lengthened facial region and snout accordingly. The bones surrounding the occiput and brain-pan are directed upwards, the former occasionally forming a great horseshoe crest. The bony nasal passages instead of coming forward lead nearly direct upwards towards the summit of the cranium, nasal bones themselves being all but absent. The orbits are often small and open behind. Curiously enough, though deficient in ears, the interior tiny ear-bones of other Mammals are in the Whales great massive structures and exceedingly dense, so much so that they are frequently preserved fossil when other osseous structures are destroyed.

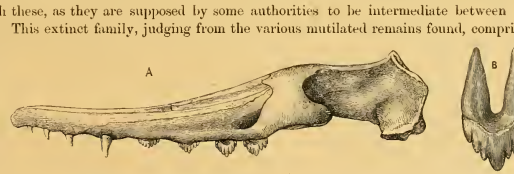
Cetacea have been a troublesome group to unravel, being ocean-dwellers, and many of them huge brutes. To study them in the live state has been difficult, and their carcases when captured or stranded on shore are as unmanageable for purposes of examination. As to their classification the two sub-orders—Denticete, Toothed Whales, and Mysticete, Whalebone Whales—are universally accepted. As regards the families, the main groups are tolerably well agreed upon, though differently named by authorities. Among the sub-families, the genera and the species, there is less unanimity. The grouping of the living forms proposed by Professor Flower is in Great Britain more frequently adopted, while MM. Gervais and Van Beneden, in their great work on "Osteographie des Cétacés," have collated the living and fossil forms. Some species and genera of Whales are restricted within given areas, as are the Seals, but of the habitat of many others in truth so little is known that no defined limit can be assigned. The great majority are migratory; some are gregarious, others more solitary in disposition. A few are quite fluviatile; but most are found in the high seas. Following the above primary divisions, we give precedence to

THE TOOTHED WHALES (DENTICETE.)

Except the possession of teeth, no other available common character need here be given.

THE SEAL-TOOTHED WHALES (PHOCODONTIA OR ZEUGLODONTIA).

We begin with these, as they are supposed by some authorities to be intermediate between the Seals and Whales. This extinct family, judging from the various mutilated remains found, comprised several different genera. The most notable of these are Zeuglodon, Squalodon, and Phocodon. The ZEUGLODONS may have attained a length of fifty or sixty feet. Their vertebral column was cetacean in character, but the neck-bones were separate, though considerably flattened from before backwards. Some assert that their skull bore resemblances to that of the Seals in several respects. Their brain-cavity undoubtedly was remarkably small, and relatively less than that of known Whales; but the supposed Seal-like skull structure is open to question. The teeth were of two kinds: those in front being conical, pointed, and lengthened; and those behind laterally compressed, serrate, and double-rooted. The dental formula is stated to have been—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{5-5}{5-5} = 36$. Hind limbs may have been absent, but the fore limbs suggest rather than furnish precise data showing approximation to the Seals. The SQUALODONS are known chiefly from the skull, which, as a whole, has strong resemblances to those of the curious Amazon Dolphins, called Inia and Pontoporia, but the dentition, however, agrees rather with that of the Dolphin of the Ganges, *Platanista*. They possessed



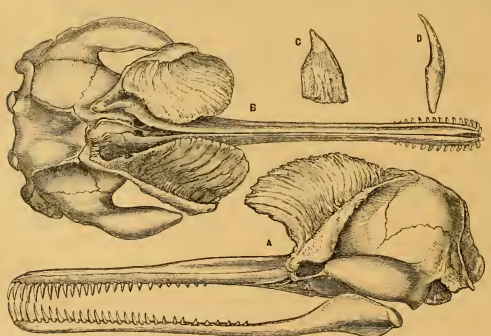
RESTORATION OF SKULL (A), AND TOOTH (B) OF ZEUGLODON. (*After Gaudry.*)

a long, narrow snout, but no special crest on the summit of the head, and the blow-holes were situate as in the foregoing three last-mentioned living genera. Van Beneden has given the following formula of the dentition:—Incisors, $\frac{3-3}{3-3}$; canines, $\frac{1-1}{1-1}$; molars, $\frac{11-11}{11-11} = 60$. Their teeth in most respects resembled those of the Zeuglodons. Much less is known of the PHOCODONS, our information regarding them being chiefly derived from the teeth. These latter were not unlike the rearmost of those of the Zeuglodons and Squalodons. The Zeuglodons have been found in the Eocene and Miocene strata of North America. The first remains from Alabama were considered by Dr. Harlan to be those of an enormous reptile (*Basilosaurus*), but Professor Owen proved their Mammalian character from the teeth being implanted in distinct sockets. The Squalodons and the Phocodons have not only been found in the United States, but in Australia, and in France, Belgium, Austria, Italy, and England. Of course nothing is known respecting their habits other than what may be legitimately inferred from their skeletal peculiarities. To all intents and purposes, so far as we know, the balance lies in favour of their having had the habits of Whales. They may have been river-frequenters, and judging from the dentition their food would be similar to that of the Ganges and Amazon Dolphins.

THE RIVER DOLPHINS (PLATANISTIDÆ).

Three living forms come under this heading, which, however, barely present such characters in common as to render them a compact group; and some authorities even incline to regard them as representative of sub-families. As in the Seal-toothed Whales their neck vertebræ are separate.

THE SUSU, OR GANGETIC DOLPHIN.*—This remarkable Cetacean is never found in the salt water, or at best only in the brackish water of the Sunderbunds; its habitat being the rivers Ganges and Indus from their mouths upwards, and their various tributaries almost to the mountain ranges in the north. Specimens have been got at least 1,000 miles beyond Calcutta. It measures from six to twelve feet in length, and in colour is entirely sooty black. Its long body has a moderate girth, and just behind the middle of the back there is a slight elevation which can barely be called a fin. The tail is broadish; the flippers are short, very broad, fan-shaped, and not pointed as in most Whales. The head is globular, with a long, narrow, spoon-shaped snout. The opening of the blow-hole, unlike that of other Whales, excepting the Inia, is not transverse, but a single longitudinal slit. The eye externally, situated above the angle of the mouth, is so diminutive as barely to be visible. We may compare the Susu to the Mole in this respect, for in an adult eight feet long the whole of the eyeball is no bigger than a pea in size. Small though this eye is, nevertheless it is perfect in lens and humours, &c. The ear-orifice behind the latter may be compared to a pin-hole. The narrow rostrum of the upper and of the lower jaw is implanted with a series of teeth, more pointed and conical in front, and narrower and laterally flattened in those behind. In the young animal the difference between the



SIDE (A) AND UPPER (B) VIEWS OF SKULL; (C) REARWARD AND (D) FORWARD TOOTH OF YOUNG OF GANGETIC DOLPHIN. (*After Gervais and Van Beneden.*)

* *Platanista gangetica.*

anterior and the posterior teeth is exceedingly marked in size, the former being very long, the latter very short, while as age advances quite the reverse is the case. The back teeth also wear down very considerably in the crown, and increase in breadth in root-substance; indeed, as Dr. J. Anderson has shown, the true dental material is worn away, and finally nothing but bone is left. The head of the male is about two-thirds the length of that of the female, and in both its point is slightly upturned. The apparently rounded skull behind the snout has broad thick zygomatic arches, and above and in front of these the cheek-bones (*maxillæ*) each send forwards and inwards a great roughened sheet of bone or crest, which forms a kind of open helmet. In the large hollow between these bony plates, and somewhat behind, are situated the nasal orifices, which are slightly awry.

The Susu frequents the deep reaches and creeks of the river, occasionally coming to the surface to

GANGETIC DOLPHIN.

blow, and although often heard are but seldom captured. Ordinarily their movements are slow, but at times they seem exceedingly active. Their food is chiefly fish, shrimps, &c., which they grovel for among the mud, something like Pigs wallowing in the mire. Grass, rice, and shells have been found in their stomachs, but Dr. Anderson has clearly shown that they are not vegetable feeders, for in the rainy season, when great tracts of land are under water, these animals pursue the fish right into the submerged "paddy-fields," and the grass is thus most probably swallowed with their prey. The Hindoos have religious superstitions concerning the Susu. It certainly is one of the oldest known Cetaceans, since Pliny and Ælian both allude to it. It has been supposed that the kind which inhabits the Indus was a separate species, but this error has doubtless arisen from the great difference in size of the skulls of the two sexes. This animal must be all but blind, the optic nerve being no thicker than a thread; but the fact of its living habitually in muddy water renders sight less necessary than it otherwise might be. Its peculiar dentition, so like that of the ancient Squalodons in many respects, is of exceeding interest. The following is the dental formula of one specimen, $\frac{27-28}{31-32}=117$. The broad roots of the rearmost teeth are usually grooved, and this gives them a deceptive appearance of possessing more than one fang; moreover, differing as the teeth do front and rearwards, still distinctions as to incisors, canines, and molars can hardly be said to exist.

FLIPPER OF GANGETIC DOLPHIN.

The Inia, or Amazon Dolphin,* is another of the remarkable fresh-water forms. The former name is that given to it by the Indian tribes of Bolivia. It ranges from the mouth of the river up the whole of its affluents of any magnitude, 2,000 miles from the sea. Mr. Bates, in his "Journey on the Amazon," tells us that when it rises the top of the head is the part first seen; it then blows and immediately afterwards dips head downwards, its back curving over, exposing successively the whole dorsal ridge with its fin. It seems thus to pitch heels over head, but does not show the tail fin. It generally goes in pairs. Exceedingly numerous throughout the Amazons, it is nowhere more plentiful than in the shoaly water at the mouth of the Tocantins, especially in the dry season. The Indians have a story that the "Bouto," as they also call this creature, "once had the habit of assuming the shape of a beautiful woman, with hair hanging loose to her heels, and walking ashore at nights in the streets of Ega, to entice the young men down to the water. If any one was so much smitten as to follow her to the water-side, she grasped her victim round the waist and plunged beneath the waves with a triumphant cry." It is held in veneration, and on this account the Indians can hardly be induced to harpoon it. They have a superstition that blindness results from the use of its oil (which nevertheless is excellent for lamps), and though Mr. Bates prevailed upon an Indian to capture one, the fellow repented of his deed the day afterwards, declaring that his luck had there and then forsaken him. This animal is seven or eight feet long. Its colour commonly is bluish above, passing into a pale flesh-colour beneath, the tail and flippers being bluish, but the tints vary considerably, and even differ with age and season. The head is furnished with a long beak. There is a kind of keel-shaped dorsal fin, and the flippers are of fair size, broadish and tapering, thus differing from those of the Susu. The skull has a certain resemblance to that of the Gangetic Dolphin, but without the great cheek-crests peculiar to the latter, besides other minor differences. In both jaws there is a long series of stout conical teeth of a pretty uniform size. These vary in number in different specimens, as the following formulæ in two separate individuals show $\frac{26-26}{25-27}=104$; $\frac{34-32}{33-32}=131$. The muzzle of the young is hairy; while both the eye and the ear-hole are much better marked than in the Susu. It is a fish-eater, and the mother exhibits great affection and devotedness towards her young.

The Pontoporia.†—Like Inia this is a South American form, and is now known to inhabit the mouth of the La Plata and other rivers entering into the Atlantic on the coasts of the Argentine Republic and Patagonia. But, unlike the two preceding forms, it is not confined to the rivers, for it ranges along the sea-coast. The very few specimens met with show it to be a small animal, not more than four feet long, of a blackish tint, pale beneath, with a white streak along each side from behind the blow-hole. It has an unusually long narrow beak, but not such a prominent head as in the two others. This animal has a well-marked triangular dorsal fin, and the fore-flipper is somewhat fan-shaped and broadish, and not pointed as in the Inia. The crestless skull has characters intermediate between the river Dolphins and the marine Dolphins to be described farther on. The teeth are small and very numerous, somewhat fewer in the young animal, conical in shape, with a swollen ring round their base. The dental formula is as follows:—$\frac{53-54}{53-53}=212$; or $\frac{57-57}{54-54}=222$.

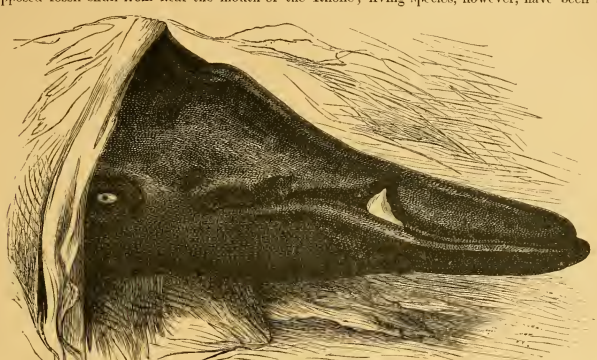
THE ZIPHIOID WHALES (ZIPHIIDÆ).

These singular Whales form a very compact group, closely united by common attributes, but they are readily separated by definite characters from others. Until the beginning of the present century, the Bottlehead (or Butzkopf) was that only known. Since then, at irregular intervals, chiefly solitary individuals have been caught or stranded in various parts of the world; but even now the numbers coming under observation have been few. Their apparent comparative rarity in the present day is in great contrast with the frequent discovery of their remains in the Norfolk Crag formations, where fragments, principally of their dense solid beaks, show that they must have been at a long distant period exceedingly numerous. On these grounds the supposition has been expressed that the present paucity of forms is indicative of a survival of an ancient family that once played an important part in Nature. The living forms range from fifteen to thirty feet in length, but their ocean habits are extremely obscure. Their common characters are long narrow beaks, elevated heads, a small but well-marked dorsal fin placed behind the middle of the back, short flippers with rounded extremity, a pair of short throat-

* *Inia Geoffrensis.* † *Pontoporia Blainvillii.*

furrows of a V-shape (point in front), a single somewhat crescentic blow-hole, placed crosswise in the middle of the head, absence or only rudiments of teeth in the upper jaws, and one or two pairs of very peculiar teeth, variable in size, in the lower jaws, along with certain other peculiarities of the skull. We shall refer but to a few of the group.

Of the genus *Ziphius* we may admit CUVIER'S WHALE* and VAN BENEDEN'S WHALE.† Their size appears to vary from sixteen to twenty-four feet, and their colour is said to be steel-grey, with irregular white body streaks, the abdomen also being whitish. The head is less prominent than in the Bottle-head, and the snout is a trifle shorter, with the lower jaw slightly upturned, fuller than the upper, and furnished with two teeth at the tip. The flippers are short and somewhat pointed, and the dorsal fin is situated well behind, and not very large. There is a deep hollow at the base of the rostrum or beak, over which the skull rises crest-like from behind forwards. The genus *Ziphius* was originally based on a supposed fossil skull from near the mouth of the Rhone; living species, however, have been since



HEAD OF MESOPLODON. (*After Andrews.*)

recorded, and of one from South America Burmeister gives a detailed notice under the name of *Epiodon australis*; still it is doubtful whether this is not one of the two above-mentioned animals.

SOWERBY'S WHALE‡ is representative of the genus *Mesoplodon*. This animal is black above, white below, and the sides marked with wriggly white streaks. The small dorsal fin is situated well back, the flippers are small and narrow, the head is rather low, sloping towards the beak, and the upper jaw is shorter than the under. It also has two teeth in the lower, and none in the upper jaw. Thus externally it bears strong resemblance to Cuvier's Whale, but it differs in the slender beak, without a hollow at its base. Sowerby's Whale is interesting from having been first obtained in 1800 off the Elgin Coast, and described by Mr. Sowerby as the Two-toothed Cachalot (*Physeter bidens*). The genus Mesoplodon has since given rise to considerable discussion, various names being assigned to it. Professor Flower points out that of the various Ziphioid Whales obtained on British coasts, France, the Cape, and New Zealand, described as different genera, &c., he recognises seven species of *Mesoplodon*, Sowerby's Whale being the type, and the others differing chiefly in the form of the teeth. Another of this curious family is the NEW ZEALAND BERARDIUS,§ of which some four specimens only are known to science. Dr. Julius Haast records the capture of one near Canterbury, New Zealand, in 1868, which animal was 30½ feet long, velvety black, with greyish belly. One of the observers who saw the creature alive stated that it protruded its teeth—a remarkable fact if

* *Z. cavirostris.* † *Z. indicus.* ‡ *M. Sowerbiensis.* § *Berardius Arnouxi.*

true. In its stomach were found half a bushel of the horny beaks of a species of Octopus. Professor Flower has described its skeleton, and affirms that it is truly ziphioid in character, but on the whole approaches nearer to the true Dolphins; whereas the Bottlehead is modified in the direction of the Sperm Whales. The Bottlehead, or Common Beaked Whale,* is a constant visitor to the coasts of Britain, many instances having been recorded of its capture, and one classical example came under the scalpel of the celebrated anatomist John Hunter. It inhabits the breadth of the North Atlantic, and according to Eschricht very probably spends the summer far north in the Polar Sea, and migrates southwards towards autumn or winter. Dr. R. Brown regards it as rare in the Greenland Seas, three or four, however, being occasionally seen at the mouth of Davis Strait. On the French and Scandinavian coasts small herds have sometimes run ashore. The female gives birth to a single young one in autumn. They feed chiefly on cuttle-fish, but also upon soft-bodied Trepangs (*Holothuria*). It ranges from twenty to forty feet in length, according to age and sex, and is of a uniform blackish hue, lighter beneath, but not white. The skull is most peculiar in having two crests at the occiput, of most unequal size and figure, and the cheek-bones at the root of the beak raised into a pair of huge elevations. The upper jaw is toothless, and the lower jaw has only two or three small concealed teeth. The neck vertebræ are united; and moreover the stomach is remarkable even among Cetacea for the number of chambers it contains, there being some six or seven divisions.

THE SPERM WHALES, OR CACHALOTS (PHYSETERIDÆ).

This family includes but two forms: the valuable Sperm Whale (*Physeter*) and the Short-headed Whale (*Kogia*). They are unlike in many respects, but they agree in having no teeth, or only rudimentary ones in the upper jaw, while the lower jaw is provided with a series of conical teeth. The dorsal fin is small, either hump-like or high and falcate; the flippers are very short, and situated along with the small eye near the angle of the great mouth. The neck vertebræ are fused together. The upper surface of the broad shoe-shaped skull has a large basin-like cavity, wherein in the soft parts the material known as spermaceti is lodged. The blow-hole is single, and in the case of the Sperm Whale is situated quite in front, but is placed farther back in the Kogia. In both, however, it is somewhat of an *f*-shape obliquely placed, the left extremity being much wider than the right.

The Sperm Whale, or Cachalot.†—Next to the Greenland Whale the Cachalot is by far the most important animal of the Whale tribe in a commercial point of view. A rare interest, moreover, is attached to it from the daring deeds and hair-breadth escapes of the whalers pursuing it, inasmuch as in certain cases it is among the fiercest of the Cetacea. At times it not only attacks boats and their crews in pursuit of it but there are also well-authenticated instances of ships themselves being assailed and sunk by this powerful monster of the deep. It attains a size varying from forty to seventy feet, the average of old males being about sixty feet, while the females are much smaller. It is black above, lighter on the sides, and silvery-grey on the belly parts. Its head is of enormous proportions, forming nearly half the bulk of the animal. The snout is extraordinarily dilated and terminates abruptly; the upper jaw quite overhangs the lower, and the bones of the latter are united close together for a long distance, and are furnished with from twenty to thirty teeth on each side. As shown in the woodcut, each tooth is conical and slightly curved, hollow at the base, but elsewhere it is dense and solid. When the lower jaw is closed the teeth fit into hollows in the upper lips, in this respect somewhat resembling what takes place in the Crocodile's mouth; but besides the remarkable lower jaw, the Sperm Whale's skull rivets attention from the extensive basin-shaped spermaceti reservoir already alluded to. The throat is very large as compared with that of the Greenland Whale. It was believed that there were several species of Cachalot, but only one is now acknowledged, the Kogia really belonging to a different genus. The Sperm Whale is seldom found in inland waters, but is met with in all the oceans, from the Polar to the Antarctic, though it chiefly inhabits the tropical or sub-tropical seas. Among the favourite resorts of the whalers are the coasts

TOOTH OF THE SPERM WHALE.

* *Hyperoodon rostratus.* † *Physeter macrocephalus.*

of New Guinea and adjacent parts, Australia, New Zealand, and several of the Polynesian islands, the coasts of Peru, Chili, and California, the Japanese and Chinese waters, the Molucca group, and the mouth of the Persian Gulf. Its appearance in the Atlantic has of late years been irregular and seldom, though at one time it was of tolerably frequent occurrence in the South Atlantic and American coasts, and near the Bahamas. Its steady pursuit for a long series of years has greatly thinned its numbers. About 1770 the Americans, and a few years later the British, in small ships of 100 tons and over, established the Sperm Whale Fishery with very moderate success. Before 1780 the British Government issued bounties to encourage the trade, and this led to the sending out of larger vessels, while Mr. Enderby, a London merchant, pushed the fishery into the far-distant shores of the Pacific.

SPERM WHALE.

The vessels, of much larger tonnage and better manned, were absent for two or three years, and the scenes of the chase, they say, at times almost defied description. Surgeon Beale's incident, though tolerably well known, is worth notice. On the coast of Japan, in 1832, some three boats pursued a Whale all day long. By a dexterous move the animal was at last lanced, when it spouted blood, suddenly descended about forty fathoms, and as quickly rose and dashed the boat into the air in fragments. The men clung to the oars and broken wood, and, in spite of the vicinity of Sharks and the Whale itself, were saved by the other boats, the crews of which avenged themselves by ultimately killing the Whale. Of fighting Whales there are numbers of stories, that of one old male, familiarly known as "New Zealand Tom," being still traditionally recounted in the forecastle. In 1804 the *Adonis* and several other ships simultaneously attacked the fellow, who destroyed some nine boats before breakfast, but in the end was captured, when a host of harpoons were found in its body. There can be no doubt that the Sperm Whale is a migratory animal, though its migrations are by no means clearly understood. It is a gregarious creature, "schools" of a dozen to fifty or sixty being

occasionally met with. At other times great fellows are found here and there on lonely pilgrimages, while still at other times a few together will be seen *en route* to fresh feeding-grounds. Adult females, or those with young in their company, evince a strong affection for each other, and when one is killed or sustains injury, parents or companions hover about and even render assistance. The whalers take advantage of this trait, and often kill a number ere the others make off. When, however, a company of young male Whales are found, and one is attacked, little love or interest in each other's welfare is manifested, every one rushing off helter-skelter in all directions, to the whalers' chagrin. The old "bulls," on the other hand, are more sedate and less easily frightened, and unless roused by injury to retaliate on their pursuers are more readily harpooned. The Sperm Whale is easily known from all others, even at a great distance, from the regularity of its blowing and the manner in which it throws up a volume of vapour obliquely forwards. It traverses the ocean surface in a steady methodical manner, at the rate of four or five miles an hour, its great head or hump-like back occasionally appearing above water. It will remain on the surface from ten to fifteen minutes, and then will descend, staying below an hour or more, but the females and young remain up and descend at more frequent intervals. At times, instead of quietly swimming on the surface, they proceed more quickly by a kind of lounging motion, the head being thrust well out of the water, a mass of spray, technically called "white water," accompanying this mode of progression. Occasionally they spring headlong out of the sea ("breaching"), or violently beat the surface with their tails ("lobtailing"), or at other times dash about in a variety of attitudes. Sometimes they move their fins as if feeling around for enemies, or throw their bodies awry, bringing the mouth well to the surface. It is pretty certain that Cuttle-fish form a large proportion of their food, though there is reason to believe that they do not despise fish and other marine creatures. It is still a moot point how they feed, and to what use they put their teeth. Some assert that in the depths the under jaw is lowered, and the glistening pearly teeth fully shown; attracted by the latter, its prey approach and the trap is closed. Blindness at times supervenes. Still more curious are instances where the lower jaw is twisted like a shepherd's crook, and strange to say, notwithstanding this deformity, these Whales seem fat and hearty—this fact giving rise to much speculation whether such malformation has arisen from fighting and distortion of the jaw in youth, or from other causes not yet ascertained. The Sperm Whale has its enemies, the Thresher Shark leaping on it and attacking it from above, while the daring Killer Whale (*Orca*) assaults it from below. The female, it is said, breeds at all seasons, producing one, but occasionally two, at a time.

The double-bowed whale-boats are manned by six men, and when they approach the Whale one steers aft with an oar while the harpooner plies his craft. As soon as it is struck the rowers "back" away. Meanwhile the creature dives, carrying harpoon and line, or rolls rapidly round coiling the rope on its body. The other boats approach, and as it rises harpoons and lances are dexterously used, and as the blood escapes in volumes, despite its vast efforts the creature succumbs. Immediately after its death the boats are made fast to the carcass, and the ship reached as circumstances best permit. Secured alongside, a man descends, cuts a hole behind the head, inserts a hook, often under most dangerous conditions, especially if the sea is rough. The fat or blubber is cut by sharp spades in a long spiral strip, and pulleys applied, and these skin and blubber strips, termed the "blanket pieces," are thereupon hove on deck. The carcass afterwards is rolled round and the opposite side similarly treated. The great head meantime is cut off, and floated astern until the trunk is deprived of its blubber. The head is then opened from above, and among the coarse fat and blubber of the forehead—the so-called "case"—is a fluid oily matter, the spermaceti. This substance is handed up in bucketfuls, and preserved in casks. On its removal the wedge-shaped oily and fibrous head-piece, the "junk," is next secured; head and trunk are then sent adrift. Then follows the "trying out," that is, boiling the fatty masses and extracting the oil, which operation is done in furnaces, the scraps of fat mainly serving as fuel. Finally, the oil and head matter are casked up, and a fresh look-out from the masthead is kept for more Whales. The crow's nest is a large barrel on the cross-trees, where a watcher is stationed during the whole voyage. No sooner is a Whale spied than the shout, "There she blows!" or, as the Americans have it, "There she spouts!" is replied to from the deck by a hurried rush to the boats, for each seaman's kit and provisions are beforehand ready prepared in a bundle, and before a few minutes have passed, the hardy mariners are on their way towards

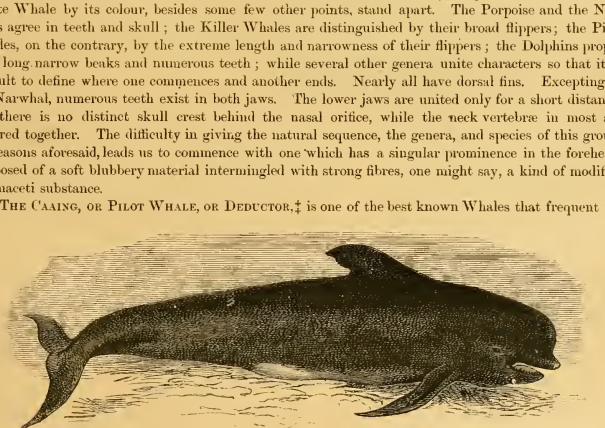
their gigantic spoil. Sperm oil, we need hardly say, is exceedingly valuable. The quantity obtained between 1835 and 1872 by the Americans alone is reckoned at 3,671,772 barrels, and the wholesale price has varied during these years from four to ten shillings per gallon.

THE SHORT-HEADED WHALE, OR SNUB-NOSED CACHALOT.*—Under this name, and possibly also that of Gray's Kogia,† an animal has been described which, far smaller in size and in many respects differing from the Sperm Whale, nevertheless is more closely allied to it than to any other of the Cetacea. Whether the two names belong to different or the same species may be left open for the present. At all events, specimens have been obtained at the Cape of Good Hope, the East Indies, and Australia, which so closely resemble each other as probably to belong to one and the same species. This animal measures from six to ten feet in length, and is almost Porpoise-like in general appearance. It has a well-marked dorsal fin behind the middle of the body, short flippers, and the snout is said to be turned up with a margin somewhat like a Pig's. The upper surface of the body is black, and the under parts have a tinge of yellow or light flesh-colour. The few specimens hitherto obtained afford no information regarding its habits. The peculiar construction of its skull, short, broad, distorted, with a bony division in the spermaceti cavity and other skeletal characters, give it an interest as being an intermediate form between the Cachalot and the Dolphins proper.

THE DOLPHINS (DELPHINIDÆ).

This group possesses considerable diversity in outward form, in skeletal characters, and dentition; nay more, many of the genera blend into each other. The Narwhal by its peculiar teeth, and the White Whale by its colour, besides some few other points, stand apart. The Porpoise and the Neomeris agree in teeth and skull; the Killer Whales are distinguished by their broad flippers; the Pilot Whales, on the contrary, by the extreme length and narrowness of their flippers; the Dolphins proper have long narrow beaks and numerous teeth; while several other genera unite characters so that it is difficult to define where one commences and another ends. Nearly all have dorsal fins. Excepting in the Narwhal, numerous teeth exist in both jaws. The lower jaws are united only for a short distance, and there is no distinct skull crest behind the nasal orifice, while the neck vertebræ in most are soldered together. The difficulty in giving the natural sequence, the genera, and species of this group, for reasons aforesaid, leads us to commence with one which has a singular prominence in the forehead, composed of a soft blubbery material intermingled with strong fibres, one might say, a kind of modified spermaceti substance.

THE CAAING, OR PILOT WHALE, OR DEDUCTOR,‡ is one of the best known Whales that frequent the



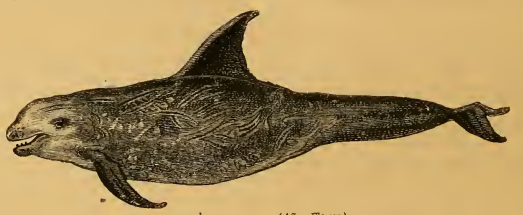
CAAING, OR PILOT WHALE.

British coasts, herds of hundreds having often been run ashore in the Shetlands, Orkneys, and even in the Frith of Forth. Adults average from sixteen to twenty-five feet in length, are of a jet-black colour, but lighter or whitish on the abdomen. The body is cylindrical, tapering to the tail; the dorsal fin is high, placed at the middle of the back; the flippers are unusually long and narrow, and the fingers possess an unusually great number of bones, as many as fourteen to the second digit. The head is quite

* *Kogia breviceps*; the *Physeter simus* of Owen. † *K.* (*Euphysetes*) *Grayii* of MacLeay. ‡ *Globiocephalus melas*.

characteristic, having the form of a massive boss. The teeth are somewhat numerous, namely, $\frac{24-34}{24-34} = 96$. When these Whales are seen gambolling in the bays of the Scottish shores, the hardy fishermen start in their boats and form a cordon seawards. Then by gunshots, shouts, splashings, and throwing stones they drive them towards the shore; and as the animals madly plunge to shallower water, pressing through fear one over the other, the men dash into the water and begin havoc with harpoons, scythes, spears, picks, or spades—indeed, whatever weapon comes handiest. Thus numbers, from even fifty to as many as two hundred, fall an easy prey. Such an encounter took place in 1867 near Prestonpans on the Frith of Forth, when one Whale wounded by harpoons struck seawards, hauling a boat and crew of twelve men nearly as far as Inchkeith ere it succumbed. There may be more than one species of this Whale, widely distributed, but whether or not, their habits and general appearance have much in common.

A rather remarkable form is Risso's Grampus,* inasmuch as its colouring and marking are so variable, and in some cases so characteristic; indeed, no two specimens yet obtained can be said to be alike. The head is fuller and rounder than that of the Porpoise, and its flippers longer and narrower —in these respects approaching the Pilot Whale. The prevailing tint is grey, darker above, and under parts paler, and in some there are a few indistinct and irregular lighter-coloured baudings. In



Risso's grampus. (*After Flower.*)

other examples, notably one obtained by M. Risso in the Mediterranean, and by Professor Flower on the British coast, the side of the body and even top of the head exhibited a mass of intercrossing, wavy, scratched lines and spots of white and grey, following no special pattern. It has been found both on the French and English coasts in spring and summer, but is suspected to be migratory, visiting Europe in summer, and proceeding to the African or possibly the American continent towards winter. The variation in colour has given rise to different specific names. Somewhat intermediate between the foregoing and the Porpoises, are certain forms found on the Indian coasts and even the Irrawaddy River; the genus *Orcella*, for example, combining the head of the Pilot Whale with the body and flippers of the Porpoise.

The Common Porpoise,† the *marsouin* of the French or *meerschwein* of the Germans, is the most familiar Cetacean of the British and adjoining coasts. Their average length is four or five feet, though often more. The colour slightly varies with age and sex, more usually a polished bluish-black tint on the upper parts, merging into a pink or mottled grey or whitish below. The dorsal fin and flippers are both of moderate dimensions. Their head is roundish, and not so blunt or bomb-like as in the *Globiceps*, nor so sharp-nosed as in the true Dolphin tribe. Its diminutive eye, no visible ear, tapering body, and broad tail are all markedly Cetacean in character, so that, though small, it gives a very good idea of the Whale tribe generally. The semilunar transverse blow-hole as it rises to the surface slightly opens, but in a tank no lofty jet of vapour is thrown up as is the case with the large Whales at sea. In looking into the pink-coloured mouth one sees above and below a row of small equal-sized simple teeth, and a flat tongue which is not protrusible. The dental formula is $\frac{20-0}{20-0} = 80$, or $\frac{20-20}{20-20} = 104$. In structural detail, both internally and in the skeleton, it is a fair type of the group Delphinidæ. Porpoises either of the common sort or species barely to be distinguished from it have a

* *Grampus griseus.* † *Phocæna communis.*

tolerably wide distribution, being found all over the Mediterranean, Pacific, Atlantic, and Arctic regions. They evidently migrate, as they appear in Davis Strait in the spring, and stop there till November. They are true fish-feeders, and herd in enormous numbers. A prettier sight can scarcely be conceived than a large shoal frolicking, dashing, and springing in all manner of fantastic curves with an amazing rapidity. Woe betide the "schools" of Herrings, Mackerels, and Pilchards that are followed by these rapacious creatures, which cause great havoc among them! They give birth to their young about May. Mr. H. Lee, on Mr. Scott Siddons' authority, relates that in the surveying voyage of the *Herald* the natives of Moreton Bay entreated the seamen "not to shoot their tame Porpoises." These crowded lazily near the shore, and when a shoal of fish entered the bay the people roused the

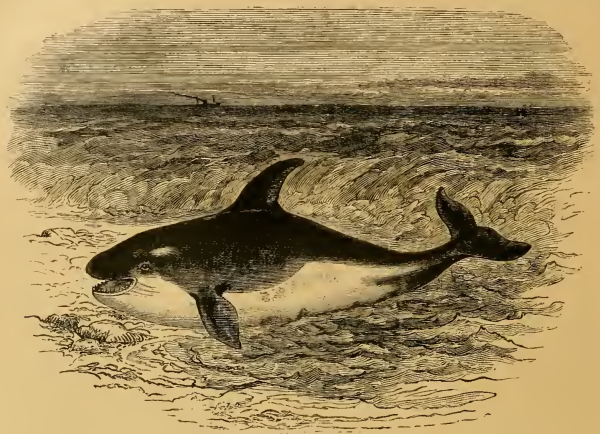
SHOAL OF PORPOISES.

Porpoises, which dashed among the fish, ate some, and drove the rest ashore. Porpoise flesh, though no longer an article of diet, was once held in high estimation, and even graced the royal table as late as the time of "bluff King Hal." Porpoise meat was generally eaten with a kind of mint sauce, and porpoise pudding was not an unusual dish during Lent as coming under the denomination of supposed fish. "Porpoise leather" now in vogue is in reality the skin of the White Whale.

THE KILLER WHALE, OR ORCA,* is truly the terror of the ocean. Not only Porpoises, White Whales, and Seals spring out of the water and run ashore in fear of it, but the great Sperm Whale and the Greenland Whale stand in deadly awe of its attack. It ranges in size from eighteen to thirty feet long, and its fierceness and voracity are unbounded, as is well shown in an example which came under Eschricht's observation. From the stomach of this individual he took thirteen Porpoises and fourteen Seals, and the atrocious glutton had been choked in the attempt to swallow a fifteenth! Hollböll saw a herd of White Whales driven into a bay in Greenland where they were literally torn to pieces by these voracious Sea-wolves. Scammon says that three or four do not hesitate to grapple with the largest Baleen Whales; the latter, often paralysed through fear, lie helpless and at their mercy. The Killers, like a pack of hounds, cluster about the animal's head, "breach" over it, seize it by the lips, and haul the bleeding monster under water; and should the victim open its mouth they eat its

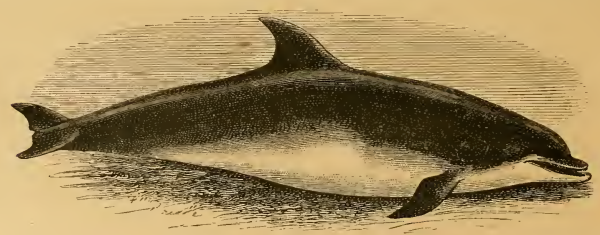
* *Orca gladiator.*

tongue. In one instance he relates that a Californian Grey Whale and her young were assaulted; the Orcas killed the latter, and sprang on the mother, tearing away large pieces of flesh which they greedily devoured. These brutes have been known to attack a white-painted herring-boat, mistaking it for a



KILLER WHALE, OR ORCA.

Beluga; and it is stated that occasionally they will boldly lay siege to Whales killed by the whalers, almost dragging them perforce under water. Near some of the Pacific sealing-grounds they continually swim about and swoop off the unwary young; even the large male Sea Lions hastily retreat ashore and give these monsters a wide berth. The Walrus also, with his powerful tusks, cannot keep the Killers at bay, especially if young Morses are in the herd. The cubs on such occasions will mount upon their mother's back for refuge, clinging for dear life; but the Orca, diving, comes suddenly up with a spiteful thud, and the cub losing its balance falls in the water, when in an instant it is seized by the remorseless Whales. These latter do not restrict themselves in diet solely to their own or the Seal tribe; for Scammon asserts that they even make marauding expeditions up strong-flowing rivers



BOTTLE-NOSE DOLPHIN. (*After Flower.*)

in pursuit of the Salmon and other fishes, a statement corroborated by observers on British coasts. The great swiftness of these creatures is best realised by the fact that they pursue and overtake the quick-swimming Dolphins, literally swallowing them alive. They are not gregarious in the sense of being found in large herds, but follow their prey in small squads. At times they move rapidly near the surface, their great back-fins projecting, or they tumble and roll about, even leaping out of the water and cutting all manner of capers. They have an evenly-rounded head, blunter than the Porpoise's, the upper jaw a trifle longer than the lower. Their flippers are broad and oval-shaped, and what renders them peculiar and easily recognised is their greatly-lengthened dorsal fin, in some species said to be equal to one-fifth of the whole length of the animal. Though slightly varying in colour, they are usually glossy black above, and white below, the tints sharply defined. Above

DOLPHINS PURSUING A BOAT.

the eye is a white patch, and occasionally there is a greyish saddle mark on their back. Their capacious mouth is provided with eleven or twelve teeth on each side above and below, and each tooth is most powerful, conical, and slightly recurved.

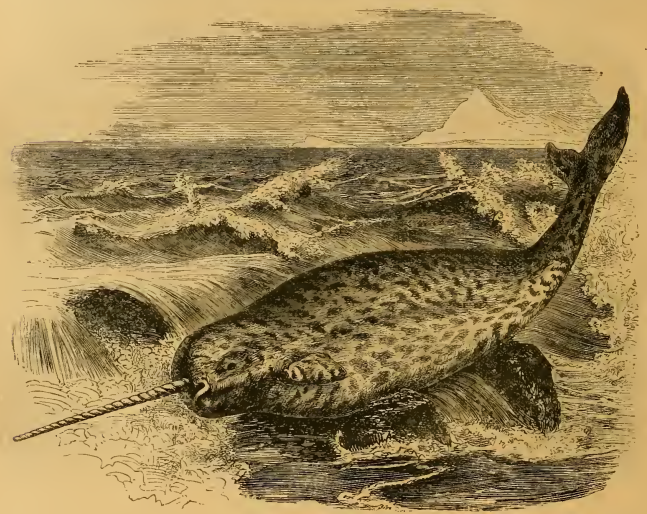
The True Dolphins, from which in fact the group *Delphinidæ* takes its origin, are associated in mythology and poetry to a considerable extent. The car of Amphitrite drawn by these oceanic animals is well known. The Common Dolphin * and the Bottle-nose Dolphin † of British coasts are kinds familiar to fishermen and sailors, the former evidently being that known to the ancients. Naturalists have recognised many genera and numerous species of the Dolphin tribe, but into these and their distinctions we shall not enter. If we take the common Dolphin as a representative, it will be seen that the head has a well-marked rostrum or beak, and an abruptly-rounded forehead; the dorsal fin is high, and the flippers of moderate size. When adult they average from six to eight feet in length. Their colour is black above and brilliant white beneath; though many of the species of Dolphins are parti-coloured, white predominating. The teeth vary in number from forty to fifty on

* *Delphinus delphis.* † *D. tursio.*

each side, above and below—that is, from 160 to 200 in all. They feed on fish, medusæ, and crustaceans; and they congregate in great herds, never being seen alone. This species inhabits the North Sea, the Atlantic, and the Mediterranean; but the different genera and species of the Dolphins have a wide range over the seas of the warmer and of the temperate zones; some even ascending rivers after their prey. As a group their habits are considerably alike, and they are all excessively playful and active, and seem to delight in gambolling around vessels,

> "Or dive below, or on the surface leap,
> And spout the waves, and wanton in the deep."

THE WHITE WHALE, OR BELUGA.*—In September, 1877, a White Whale nine feet and a half long,



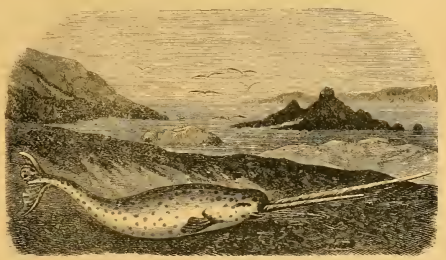
NARWHAL.

which had been captured on the coast of Labrador, arrived at the Westminster Aquarium. Though not of the largest size—for they attain a length of even sixteen feet—this example nevertheless was characteristic. Symmetrical in form, creamy white in colour, without dorsal fin, with short stumpy flippers, and a bulging-rounded forehead, there could be no mistaking the species. Unfortunately it lived but a few days, though Mr. Barnum was more fortunate in keeping these creatures alive in a tank in his museum at New York. The dental formula of the Beluga is $\frac{8-8}{4-4} = 32$; or $\frac{10-10}{10-10} = 40$; the small conical teeth are implanted only in the front of the jaws, and frequently drop out early in life. It is abundant over a wide area of the northern regions, and is very partial to ascending rivers after fish, for a long distance. Dall records one taken 700 miles up the Yukon river, and Nordmann mentions that it ascends the river Amoor. It is well known in the St. Lawrence and Labrador coasts, as also in the White Sea, where there is a regular White Whale fishery; but withal it is truly a Greenland Cetacean, being found there all the year round. Like the Narwhal it is very gregarious,

* *Beluga leucas.*

sportive, and migrates in numbers, both sexes associating in the droves. It is fearless and inquisitive, approaching the ship with an easy roll, occasionally emitting a whistling sound; hence seamen call them "sea canaries." The female gives birth to a young one in the spring months, and this is of a bluish-grey colour, paling with age. Their docility and indeed intelligence, when captured, are well illustrated by one in America, which was trained to draw a car round the tank. It recognised its keeper, and allowed itself to be freely handled. It would play with a Sturgeon and a small Shark as a Cat would with a Mouse, but without injuring them; at other moments it would splash about and toss stones with its mouth. The Greenlanders dry their flesh for winter use, hoard their oil, and capture them by nets at the entrance of the fjords and inlets whenever chance permits. Five hundred or more every year are thus obtained. Dr. Rae says that the Beluga is similarly caught by nets in the St. Lawrence. The Indians also paint their canoes white and sail promiscuously among them, harpooning betimes. Every part of the animal is valuable to the natives of the north, the skin being manufactured into capital leather. A white Porpoise-looking Whale visits Amoy and other southerly harbours of China, but it is a true Dolphin (*D. sinensis*), and not a Beluga.

THE NARWHAL, OR SEA-UNICORN.*—Of all Whales this is the most unique on account of its so-called horn, or rather tusk, or, still better, enormously-developed canine tooth. Most museums contain examples of this extraordinary object, which seems like a solid rod of ivory, tapers from root to tip, has a kind of striated spiral surface, and is often from five to seven feet or more in length, thus being the longest tooth in the Mammalia. The adult animals vary from ten to sixteen feet long, and, like the Beluga, have a blunt short head, no dorsal fin, and very small flippers. It is essentially a northern form, inasmuch as it frequents the coasts of Greenland, Spitzbergen, and Siberia, though occasionally met with off Scandinavia and Britain, its favourite haunts, however, being 70° to 80° N. lat. It travels in great herds, and Dr. R. Brown avers that he saw thousands in their summer migrations following tusk to tusk and tail to tail like a regiment of cavalry, and swimming with perfect, regular, undulating movements. These herds are of both sexes. The Narwhals have grey backs, mottled with black, the sides and belly paling downwards to white, and equally spotted with grey or darker tint. The females are more spotted than the males, the young are darker, but some animals are much paler than others. The crescentic blowhole externally is single. Occasionally they utter a gurgling noise. In the stomachs of captured Narwhals, fish-bones, Crustaceans, Molluscs, and Cuttle-fish remains have been found. They swim with great velocity, and are most active creatures. They dash and sport about apparently with much glee, and Scoresby says that in their playful moments they parry horns as if fencing. He suggests that the horn may be used for spearing fish, as he found a large flat Skate in the stomach of one. Others imagine that it may be for stirring up food from the bottom; but it has been very deftly remarked that the female would thus fare badly, seeing she is destitute of the tooth in question. Fabricius' view, that it was to keep the ice-holes open during the winter, has a touch of truth in it, inasmuch as one among other instances has been recorded where it usefully supplied such a purpose. Dr. R. Brown mentions that in 1860 a Greenlander observed in a hole in the ice hundreds of Narwhals and White Whales protruding their heads to breathe. It was likened to an Arctic Black Hole of Calcutta, so eager were the creatures pushing towards it. The natives gathered around, harpooned and shot the creatures by the dozen, though many were lost, such was the



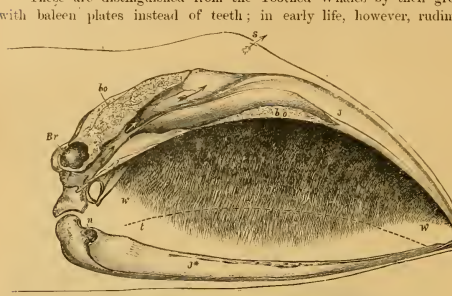
NARWHAL WITH THE TWO TUSKS DEVELOPED.

* *Monodon monoceros.*

scramble. The Narwhal possesses only two teeth: the greatly-developed or left canine, and within the jaw on the right side the rudiment of a similar tooth which seldom is protruded; although in certain rare cases, instead of one, the two tusks are developed. Along the jaw or gum there is a scolloped appearance foreshadowing as it were teeth. In the palace of Rosenberg, Dr. R. Brown states, there is a throne manufactured of Narwhal ivory, and Captain Scoresby had a bedstead made of the same substance. A Greenlander's dainty is Narwhal skin boiled to a jelly, this dish of *mattak* being a *bonne bouche* offered to strangers. The oil is very superior, the flesh extremely palatable. Though so peculiar in appearance and dentition, this veritable unicorn in all other structural peculiarities is truly a Dolphin.

THE WHALEBONE WHALES (MYSTICETE).

These are distinguished from the Toothed Whales by their great upper jaws being provided with baleen plates instead of teeth; in early life, however, rudimentary teeth occasionally are present, but these never project beyond the gums. Their skulls are symmetrical and not distorted as in the Denticete. The organ of smell is distinctly developed, and there is a double aperture to the blowhole. The separate bones in the lower jaw arch widely outwards. The upper jaws are relatively narrow and project forward at the same time with a great fore and aft arch, but are encompassed by the lower jaw arches. The head is proportionally of immense size, and admits of an extraordinarily capacious mouth. The palate is but a narrow median line, and the huge mouth little else than an enormous dome of whalebone plates whose inner lower margins are frayed. Thus while the whalebone is longer than the depth of the closed mouth, it nevertheless is accommodated by being tucked in below at its flexible extremities. A great broad massive tongue fills the interspace between the lower jaws. From this peculiar mouth-formation, the bony area of and around the brain-pan is relatively small.



MEDIAN SECTION SHOWING INSIDE LEFT HALF OF SKULL OF WHALEBONE WHALE, WITH BALEEN IN POSITION. (*Modified after Eschricht.*)

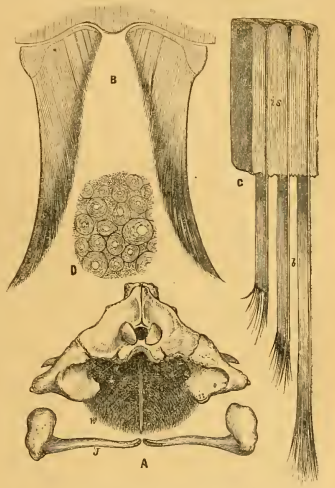
Br, brain cavity; *J*, *J**, upper and lower jaw-bones, *bo*, *bo*, being roughened parts of bone sawn through; arrows indicate nasal passages, which open at *s*, spout-hole; *w*, whalebone; *t*, tongue in dotted outline; *n*, nerve aperture lower jaw.

Most people have seen a large plate of whalebone, dark-tinted or occasionally lighter, and one extremity ending in a fringe of bristle-like hairs. The whalebone blade of dense horny-like material is in the early stage composed of a brush of hair-like bodies, which, lengthening, solidify and assume the hard horny appearance afterwards known in the blade. The gum of the upper jaws has a series of these plates, the one in front of the other, which elongate as growth proceeds, but leave the free extremity with a fringe of separate hairs. Again, the blade towards the gum is embedded in a fleshy substance similar to the roots of our finger-nails. It grows continuously from the roots, like the latter, and in many respects corresponds, save that the free end is always fringed. Baleen, therefore, though varying from a few inches to a number of feet long, in fact approximates to a series of so to say mouth nail-plates, which laminæ have a somewhat transverse position to the cavity of the mouth, and thus their inner split edges and lower free ends cause the mouth to appear as a great hairy archway, shallower in front and deeper behind. The animal in opening its mouth gulps a quantity of water containing its minute marine food, and then closing the mouth the liquid escapes and the small mollusca, &c., are entangled in the hairy meshes. Some of the Whalebone Whales are distinguished as smooth-skinned and as wanting dorsal fins—the family Balænidæ, or Right Whales.

GREENLAND OR RIGHT WHALE.

Others have either a hump-like protuberance or dorsal fin or a series of longitudinal skin-plaits on the throat—the Balænopteridæ, or Humpbacks, and Rorquals.

THE GREENLAND, OR RIGHT WHALE.*—Among the Cetacea this, *par excellence*, may be denominated *the* Whale, for much of the popular knowledge, interest, and commercial value of the group has centred in this animal. It is the well-known form followed by the Greenland whalers into the Arctic seas. The stories of its hunting and authenticated accounts of its vast size, &c., associate it in many minds as the most typical of the Whale tribe. But the truth is, it is unusual in many respects, and not even quite representative of the group of Whalebone Whales as a whole. Moreover, it is as well at first to take notice of the fact that of the genus *Balæna*, that to which the term Greenland or Right Whale is applicable is not the only species. For a long time it was believed that this Whale inhabited a very large area of the oceans. Later data, however, go to show that at least five species have existed or still exist, each restricted within a moderately defined area. *B. mysticetus* reaches from the Gulf of St. Lawrence up Baffin's Bay and Smith's Sound, and westwards by Barrow Strait, &c., to the extremity of the North American continent, and descends to Behring Strait, Kamstchatka, and the Sea of Okhotsk. It moreover passes along the Arctic Ocean from Behring Strait to Spitzbergen and the east of Greenland, that is, it has a circum-polar area, in the two points already named descending to lower latitudes.



VIEWS TO ILLUSTRATE POSITION AND STRUCTURE OF BALEEN.
(*Modified partly after Eschricht, Owen, Turner, and Prichard.*)
A, back of skull of Right Whale, looking into mouth, with *w*, whalebone, *m* being maxillary bone of palate, *J*, lower jaw-bones; *B*, arch of baleen plates, as seen in cross section of mouth; *C*, vertical section through gum, palatal, or intermediate substance (*ie*) with the three baleen plates arising therefrom; *D*, whalebone in cross section under the microscope and showing hair-like structure.

THE BISCAY WHALE (*B. biscayensis*) differs in a proportionally smaller head; shorter, thicker, and more brittle baleen; smoother, thicker skin; and slightly bluish shade of colour. From the eighth to the tenth century the Basque people established a Whale fishery right in the middle of the Atlantic, and even to the beginning of the last century it was known that the same kind of animal was pursued across the Atlantic as far as Florida, and beyond Great Britain towards Iceland. But these hardy seamen followed the Whale with such vigour as to diminish, and, as was believed, drive it within the Arctic circle, an assumption which has disappeared before the knowledge that it differs from the so-called Greenland Whale. Almost between the same parallels in the Pacific Ocean from the American to the Asiatic shores is another—the JAPAN WHALE (*B. japonica*)—pursued by English, American, and Japanese whalers. This black animal, with a white eye-spot and paler on the chin and belly, has slenderer but equally long baleen, and in certain osteological features is regarded as specifically distinct. Another Whale, the CAPE WHALE (*B. australis*), ranges from the Cape region across the South Atlantic to the coast of South America below Brazil. While a fifth, the SOUTH PACIFIC WHALE (*B. antipodarum*), occupies a strip from the South American coast to New Zealand and Australia. The two latter have points in common with the others, and are only distinguished as separate species by supposed structural variations.

The habits of all these animals are exceedingly alike, and only in the first two is there very decided distinction in appearance. Such being the case, we may refer in detail to the Greenland Whale, Bowhead, or great Polar Whale of the Americans. This creature ordinarily attains a

* *Balæna mysticetus.*

length of fifty or sixty or not more than seventy feet. The females are said to be larger and fatter than the males, to produce one or rarely two young ones in the spring, which are suckled for a twelvemonth, and they exhibit a constancy and affection for this offspring not surpassed by any other of the tribe. The bulky body is largest about the middle, tapering rather suddenly towards the tail, the flukes of which are occasionally over twenty feet from tip to tip. The flipper is short and broadish; while the head is a third of the length of the animal. The small eye is placed very low, but nevertheless above the angle of the great arched-mouth. The head is surrounded by a large swelling, at which point the double orifice of the blowhole forms an obtuse angle. The adult is almost black, the young bluish-grey, the lower parts of the throat cream-colour, and occasionally dispersed whitish markings on the body. Gregarious in habit, they go in twos and threes, but sometimes in greater numbers, even in large flocks; but the herds now are indeed rare. Among the most remarkable peculiarities in this Whale are the nature of its food and its mode of feeding. In the high latitudes there floats in immense quantities a small soft-bodied Mollusc (*Clio borealis*), an inch long, with expansions like wings; and besides it there are numerous small Crustaceans and Jelly-fish of various kinds. These, curiously enough, feed on infinitesimally minute Jelly-specks, *Diatomaceæ*, &c. These latter thus form subsistence to the former, which in their turn are the Whale's food; so that, as Dr. Robert Brown has remarked, this enormous marine monster in a secondary manner is sustained by incredible numbers of organisms of which 1,000 or more might be laid on a shilling piece. Captain David Gray, a well-known successful whaler, has given a good account of the mode of feeding. When the animal opens its mouth to feed, the whalebone springs forwards and downwards so as to fill the mouth entirely. When in the act of shutting it again, the whalebone being pointed slightly towards the throat, the lower jaw catches it and carries it up into the hollow of the mouth. They choose a space between two pieces of ice, and swimming backwards and forwards secure the food near the surface. They will continue feeding in this way for hours, afterwards disappearing under the ice to sleep, and again suddenly reappearing as hunger compels them. When the food is submerged ten or fifteen fathoms, after feeding the Whale comes to the surface to breathe, and swallows its mouthful. It then lies still a minute, raises its head partially out of the water, again diving, throwing its tail in the air as it disappears. At such times the whalers successfully harpoon them. Occasionally they are easily captured, but more often are approached with great danger. The periods of surface-breathing and descents in the Right Whale are very different and irregular compared with those of the Sperm Whale. At intervals of from five to fifteen or twenty minutes they rise to breathe, and remain on the surface for about two minutes. Their ordinary rate of travelling is nearly four miles an hour, but if alarmed or wounded their pace is considerably increased. Like the other Whales, they travel head to the wind. They appear to have periods of migration. In May they are found off West Greenland; at the end of June they cross Baffin's Bay, towards Lancaster Sound and Eclipse Bay, whence in August and September they strike south, and in November or later reach Hudson Strait and the coast of Labrador. It is supposed that the young are produced in these lower latitudes, and in spring the Whales are believed to proceed again northwards. This ordinarily quiet, harmless, but unwieldy creature, whose time seems to be divided between feeding and sleeping, occasionally disports itself in fun and frolic, like its more elegant but smaller congeners. It will then throw itself clean out of the water, "lobtail," "breach," and so on.

The whaling ships, which are now most powerfully built screw-propellers, leave Britain in the beginning of May for the Greenland seas, and endeavour to come across the track of their prey in the Baffin's Bay districts. The men in the crow's-nest have a weary and cold outlook, and as opportunity offers chase is given in the whaleboat in these dreary regions under circumstances well calculated to test the bravest spirit. The vessels often hover on the edges of the ice, or ram and bore their way through it, and when Whales are announced they are assailed by the boats' crews with harpoons, lance, and at times harpoon-guns. These Whales when struck will occasionally run out more than a mile of cable, but return to breathe at no great distance, when the lance is used, and the extraordinary loss of blood weakens the monster and lays him at the mercy of his pursuers. Whales that have once been attacked and got free become very cunning, and instead of diving direct go straight along the surface, dragging boats and even ships into most dangerous positions, or cutting the ropes as they seek shelter

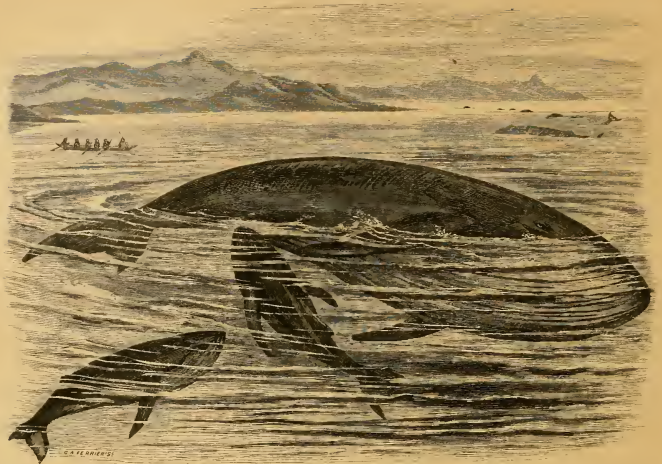
under the ice. The American whalers on the Okhotsk Sea vary their mode of pursuit according to the district, often landing and even making night whaling expeditions, being guided by the phosphorescence accompanying the creatures' movements. An ordinary-sized Whale, between forty and fifty feet, will yield, according to Scammon, from sixty to eighty barrels of oil, and 1,000 lbs. of baleen. The usual manner is for the Whale to be brought along the port side of the vessel, its tail forwards, belly up, and head aft. Tackled at each extremity, the men with spiked boots commence to strip the blubber, which is hoisted on deck. When the belly and right side with flipper are disposed of, the carcass is canted and the other side is similarly treated. The material is hastily put aside until the first quiet opportunity admits of it being cut in pieces and finally stowed in the holds, where it is kept in perfect safety until the return of the vessel. The skin and waste pieces of flesh or "kreng" are thrown away, and as the carcass and such useless matter are abandoned, they are quickly seized by the Killer Whales, Threshers, and Greenland Sharks, and by enormous numbers of sea-fowl that hover in the wake of the whaler.

HARPOON.

THE HUMP-BACKED WHALES.*—Of this genus three, four, or even more species are named by naturalists. The Long-finned (*M. longimana*), or *Kepokak* of the Greenlanders, inhabits the North Atlantic area as far as Davis Strait. A southern form, the Cape Hump-back (*M. Lalandii*), is distributed over the South Atlantic, also towards both continents. There is a South Pacific form (*M. novæ zelandiæ*), the New Zealand Hump-back, stretching to the American coast, and still another, the Japanese Hump-back (*M. kuzira*), which ranges to the Aleutian and Californian coasts. These Whales are by no means as valuable for oil or baleen as the Right Whale, and are not very frequently hunted. An adult averages fifty feet in length. The skin of the throat and belly is plaited longitudinally like corrugated iron with narrow furrows. The flippers are very long, one-third or one-fourth the length of the animal, their edges often undulating. The characteristic feature or hump, is a low dorsal fin, situate behind the middle of the body. They have a bulky, stoutish body, and a broad flat head, and the neck vertebræ are usually separate. They are black, occasionally paler below, and some have white flippers, but the baleen is black. Dr. Rink says that when struck with harpoon, the Kepokak rushes along the surface without diving. They rest lazily near the surface, beating their flippers as if scratching themselves. The Greenlanders steal up to them when asleep, and stab them with lances. All the species, at times, seem to delight in endless springing and dashing out of the water. They will yield from twenty to thirty barrels of oil, and a few hundred-weight of an inferior quality of whalebone. The Hump-back of the Pacific, according to Scammon, proceeds north in summer, and returns southwards on the approach of winter; but they have been observed with young following them at various times and seasons.

Considerable interest is attached to another Cetacean of the North Pacific, which Capt. Scammon names the California Grey Whale.† The female of this animal is from forty to forty-four, and the male seldom more than thirty-five feet in length. In shape it may be said to be somewhat intermediate between the Right Whale, the Hump-backs, and the Rorquals, though in most respects nearest the last two. It has no back fin or hump, but instead a series of cross ridges on the hinder part of the back towards the tail. Occasionally individuals are nearly black, but the more common and characteristic colour is a mottled-grey or speckled patches of white on all the upper parts, underneath being darkest in body-tint. The flippers are fully six feet long, broad in the middle, but taper to a point. The head arches downwards from the blowhole forwards, and the baleen is remarkably short, brownish-white, and coarse in texture. From November till May this Whale frequents the Californian coast, and then the females enter the shallow bays and lagoons, and give birth to their young, while the males keep seawards. During the summer months they all journey northwards along the coast, and congregate amidst the ice in the Arctic Ocean and the Okhotsk Sea. So regular are their migrations, and so close in-shore do they swim, that Eskimo and Indians alike keep watch at the proper season, and as they pass successfully attack them in their canoes. The flukes, lips, and fins form native dainties, the oil is bartered for reindeer, a

* *Megaptera*; μεγας, great, and πτερόν, fin. † *Rhachianectes glaucus* of Cope



HUMP-BACK WHALE SUCKLING HER YOUNG.

sance is made of the entrails, and the Eskimo dogs feast on the flesh. Since 1851 a system of coast and bay whaling has been profitably pursued by the Americans along the Californian shores. At first 1,000 Whales would daily pass the outlook stations, though not a tenth part are now seen, so great has been the havoc and so shy of the land and whale-boats have the Californian Greys become. In calm weather these Whales will lie motionless for an hour or so on the surface of the water, but they nevertheless seem to delight in dashing and splashing among the surf and breakers. At other times they huddle together in shoal water, almost getting aground, while their young swim freely about in sportive play. The dam's attachment to her offspring is very great, and hence lagoon whaling is most dangerous. Casualties are of constant occurrence in these narrow passages, the old Whale in her frenzy dashing her head against the boats, and lashing all around with her tail-flukes; hence the sailors call them "Devil-fish," and "Hard-head," while "Mussel-digger" is applied to them from their habit of probing among the mud. They often roam among the seaweed-banks, where the whaler shoots them with the harpoon-gun, as he lies in wait in a small boat or sailing craft. Thus this piebald Whale runs every chance of early extinction, seeing that whether in warm or cold latitudes, it is relentlessly pursued by its dire enemy—man.

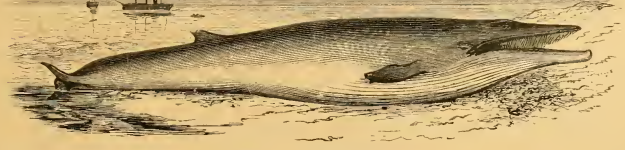
The Fin-Whales, or Rorquals,* as a group, vary exceedingly in size. Although at times of great dimensions, they are not so bulky in form and unwieldy as the foregoing whalebone groups. Their elongate bodies, smaller-mouthed heads, shorter baleen, plaited throats, and relatively narrow and small flippers, with a dorsal fin behind the middle of the back, high laterally-compressed tail-root, and separate neck-bones, besides other osteological characters, distinguish them sharply from the preceding. The amount of blubber and baleen in these Whales being exceedingly limited, coupled with their great muscular activity, restless disposition, difficulty and danger of approach, causes them to be seldom hunted. Their capture in fact is not remunerative. As a consequence, their numbers in some districts are considerable though scattered; even off British coasts certain species create

* *Balænoptera*: φάλαινα, a whale, and πτερόν, fin.

great havoc in the herring and other fisheries. There may exist from eight to a dozen fairly-recognised species, and quite as many more doubtful ones. They have been divided into several genera by various naturalists, though there is a tendency to revert to the single term *Balænoptera*. So migratory are they, so active, and changeable towards localities, that little is known of their precise geographical distribution. They are found in the Polar seas, throughout the whole of the Atlantic, in the Indian, Pacific, and Antarctic Oceans. In their habits they have much in common. Ordinarily they do not congregate in large herds, though twos and threes, and occasionally more, keep company; others seem even more solitary in disposition. They are all more or less fish-eaters, and they commit great devastation among the Cod-bearing banks and Herring shoals—six and eight hundred fish having been found in the stomach of an individual. A few attain the enormous length of even 100 feet, and sixty or seventy feet is not an uncommon average, though some of the species are by no means distinguished on account of size. One of the largest forms is SIBBALD'S RORQUAL (*B. Sibbaldii*), black above and slate-grey below, varied with whitish spots. The Icelanders term this animal "Steypireythr," and it is rather abundant in that region and South Greenland. Another of immense dimensions is known to the Pacific whalers as the SULPHUR-BOTTOM WHALE (*B. (Sibbaldius) sulfureus*). This glides with great velocity over the ocean, and is known at a distance by the vast amount of vapour it sends forth in blowing. Its yellowish belly gives its specific name. At times they appear in considerable numbers on the Californian coasts. One is recorded to have followed a ship for twenty-four consecutive days, and rifle-shots, &c., did not drive it away. The captain and crew at first had great fears of mischief, but at length the companionship of "Blowhard," as they called him, and his close approach, became a subject of interest and merriment to them. The COMMON RORQUAL, or RAZOR-BACK (*B. musculus*), black above and brilliant white below, with an average length of sixty or seventy feet, is a well-known frequenter of British coasts. The LESSER RORQUAL (*B. rostrata*) resembles the last, but never reaches more than twenty-five or thirty feet. It frequents the North Atlantic and Arctic Ocean, and is supposed to stretch even as far as Labrador, Davis Strait, and the Aleutian Isles. It likewise has been met with several times in British waters, but it is best known as the "Scigval," or Cod-Whale of Finland, and from the fact that it is a regular summer visitant to Norway.

A great many of the remains of Fossil Whales found in the Miocene and Pliocene deposits in various parts of Europe belong to the Fin-backs. One genus, the *Cetotherium*, Brandt has suggested, might form a transition between the Whales and our next order, the Sirenia. This supposition, however, is not borne out by facts, such features as denote likeness being rather deceptive. The Rhytina, a Sirenian, wanting teeth and with a somewhat Cetacean-like tail, however Whale-like in outward figure, in other respects is quite different from any member of the Order Cetacea, which taken as a whole cannot possibly be affirmed to show substantial links of close affinity either with the other Marine Mammalia or with the Land Mammalian groups.

JAMES MURIE.



COMMON RORQUAL. (*After Flower.*)

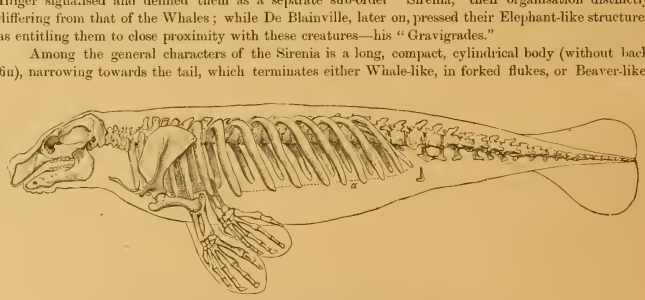
ORDER SIRENIA (THE MANATEES).

Introductory Remarks—Mermaids—Position—General Characteristics of the Order—Steller's Rhytina—Habits—Extinct—Dugong—Range—Habits—Uses—Teeth—Manatee—Distribution—Peculiar Mouth—Mode of Feeding—Story of "Patcheley," a tame Manatee—Halitherium and other Fossil Forms.

This order of the Marine Mammalia comprises only a few animals, which, however, possess a peculiar interest to the zoologist. But two genera are now found alive, and a third genus was utterly extirpated about a century ago. Others are only known from fossil remains. Notwithstanding the ungainly, almost positively repulsive, appearance of the living forms, they yet have a hold on the popular imagination on account of their being the actual representatives of the famed Sirens and Mermaids of yore. The ancients, in their voyages to Eastern climes, gathered stories concerning the existence of strange creatures, half woman, half fish, chiefly frequenting the shores of Taprobane (Ceylon); and fancy, with oft-told but unchecked repetition of tales, soon lent a charm to the supposed beings, by conferring on these sea-nymphs imaginary flowing tresses, and sweet dulcet voices, by whose luring wiles the unwary mariner was entrapped, or led to destruction. Howsoever ridiculous such notions may now be regarded, they are, nevertheless, to be satisfactorily explained, for the singular Dugong, with its fish-like tail, roundish head, and mammæ on its breast, has the habit of occasionally raising half of its body perpendicularly out of the water and clasping its young to its breast. These actions have, doubtless, given a colourable pretext to all the fables of mermaids—those "missing links," which even yet our children delight in, when narrated in "The Little Mermaid," by the talented pen of a Hans Andersen.

The Manatee or Dugong group, partly from aquatic habitat and some outward resemblances, for long was classed among the Whales; by F. Cuvier they were termed the Grass-eating ("les Cétacés herbivores") in contradistinction to the flesh-devouring Cete, or Whales proper. Early in this century Illiger signalised and defined them as a separate sub-order "Sirenia," their organisation distinctly differing from that of the Whales; while De Blainville, later on, pressed their Elephant-like structures as entitling them to close proximity with these creatures—his "Gravigrades."

Among the general characters of the Sirenia is a long, compact, cylindrical body (without back fin), narrowing towards the tail, which terminates either Whale-like, in forked flukes, or Beaver-like,



SKELETON OF MANATEE. (*Modified after De Blainville.*)
a, Dotted outline of Lungs.

in a great, flat, fibrous expansion, in either case set horizontally. The fore-limbs are encased, flat, and flipper-like, exceedingly flexible, and more completely formed than in Whales. The extinct and fossil Halitherium alone is known to have possessed rudiments of hind-limbs, though pelvic bones are present in all. Ears are wanting, and the eyes are very small, whilst two valvular nostrils are situate over a full prominent muzzle, which is provided with a copious supply of peculiar short bristles, while the inside angles of the mouth are hairy. Their dark skin is Elephant-like, tough, rough, sparsely hairy, or smoothish and Whale-like. The two mammæ are on the breast close to the armpits. One genus (Rhytina) was toothless, but the others had ample dentition. Moreover, in all the front of the upper and lower jaws is provided with curious, rough, horny pads or plates. The larynx differs from that of the Cetacea and resembles that of Land Mammals. The midriff, or

diaphragm, is most unusually lengthened backwards. The apex of the heart is cleft, giving the appearance of a double organ, and the blood-vessels almost everywhere in the body and limbs split into *rete mirabile*. The stomach has two main digestive chambers, and to the first is added a pair of small divergent horn-shaped appendages, besides a remarkable finger-shaped gland. Unlike Whales or Elephants their small brain has few convolutions. All the bones are dense and heavy, and are the most solid among Mammals. Manatus is unique among the living Mammalia in having but six neck vertebræ, and, as in the other Sirenia, they are all separate. The ribs are uncommonly thick. The skull is relatively much smaller than in the Cetacea, is low set, somewhat elongated, and truncated at each extremity. The side bones (*parietals*) meet above, the occiput is small, the orbits well defined, and the nasal passages are directed forwards; the lower jaw has a high vertical limb (or ramus) behind, and in the Dugong the upper and lower jaw-bones are strangely bent down. The Sirenia are animals of slow habit, and are most inoffensive. They feed solely on aquatic vegetation. As being the most Whale-like in size and shape of tail, we shall first introduce to notice the Rhytina.

Steller's Rhytina,* the Morskaia Korava of the Russians, and alone representative of the genus, is a creature now extinct, but which was living and in tolerable abundance a hundred and fifty years ago. When the Russian, Behring—after whom the Strait is named—first visited that region and the neighbourhood of Kamstchatka, there existed a huge animal, of which, under the name of Manatee, or Northern Sea Cow (*Vacca marina*), the naturalist Steller, who accompanied him, gave a classical account. It had a small oblong head, a full bristly snout, a dark-coloured body, protected by a rugged, gnarled, warty, hairless skin. The fore limbs were quite short and stumpy, hairy at their ends, and they had no finger-bones beyond the wrist. The tail was black, ending in a horizontal, stiff, half-moon-shaped, narrow fin-blade, fringed with a fibrous whalebone-like material. It had no teeth, but horny, almost bony plates, corresponding to the horny gum-pads of the Dugong and Manatee, served the purpose of mastication. According to Steller, it attained a length of from twenty to twenty-eight feet.

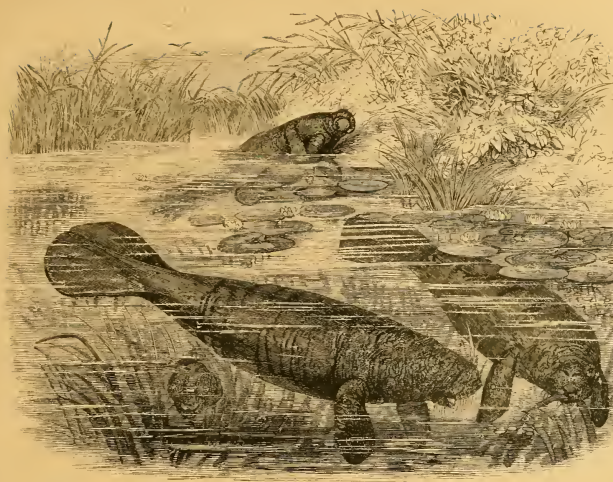
Though stupid, voiceless, animals, they were of a very affectionate disposition, and were readily tamed, even allowing themselves to be handled. Their conjugal affection was strikingly developed. A male, who in vain attempted to relieve his partner, stuck by her, in spite of repeated blows, and when she died he returned to the spot for some days, as if he expected to see her again. They were very voracious, and fed on seaweeds, with their heads under water; and every now and then they raised their noses to breathe, and made a snorting noise. They appeared in families, each consisting of a male, female, one half grown, and a cub born in autumn; and sometimes these families united into great herds. As they were very good eating (far preferable to salt junk), Steller recommended them as articles of diet to the sailors; and so faithfully was his advice observed by natives and seamen, that within twenty-seven years of his first visit the last Rhytina was killed, namely, in 1768. They were hunted with a boat-hook attached to a long rope, which, when the animal was struck, was passed to a company of men on shore, who, with considerable difficulty, managed to land the huge Sea Cow. This animal appears to have had an extremely limited range, having never been met with anywhere but in the small Behring Island, off the coast of Kamstchatka. Their sudden extinction is a most noteworthy fact, and but for Steller's admirable account nothing whatsoever would have been known of the habits, internal structure, or outward appearance of this singular Sirenian. Though the adults were toothless, yet by some it is supposed from analogy that in early life functionless teeth may have existed, though these never appeared above the gums. The Rhytina, in its forked tail, somewhat down-bent jaws, and other points, resembled the Dugong; while in skull characters and skin it was like the Manatee; and though somewhat whale-shaped, it was a true Sirenian.

The Dugong,† typical of the genus Halicore, is a living form, ordinarily from ten to twelve feet long, though very old males are said occasionally to reach as much as eighteen to twenty feet. Its distribution is rather widespread, namely, from the Red Sea and East African coasts to the west coast of Australia; and they are even yet not unfrequently met with within these limits, on the coasts of Mauritius, Ceylon, and the Indian Archipelago, though in numbers fast becoming thinned. Outwardly they differ from the Rhytina in being smoother-skinned, and in having the fore-limbs longer, and the tail semi-lunar, but deeper or less fluked, and not marginally split. Their colour is

* *Rhytina Stelleri.* † *Halicore dugong.*

slaty-brown or bluish-black above, and whitish below. The early traveller, Leguat, speaks of droves of several hundreds grazing like Sheep on the seaweeds a few fathoms deep in the clear waters of the Mascarene Islands. Usually this tropical animal frequents the shallow smooth waters of the bays, inlets, and river estuaries where marine vegetation (fucus and seaweeds) is in abundance, and there it leisurely feeds, being lethargic in disposition, but an immense eater. When they have not been much chased they are not shy or timid, and even allow the natives to handle them; on which occasions the admiring spectators generally manage to abstract the smaller and fatter cubs as dainties, for they are considered uncommon good food. So highly prized are they, that the Malay king considers it a royal "fish," and he claims all taken in his dominions. The flesh of the young, when cooked in a variety of ways, is certainly wholesome—by some compared to veal, and by others to beef or pork—but the older animals are tougher. The Moreton Bay colonists call them "Sea Pig." They yield a clear oil of the best quality, which is free from all objectionable smell, and it is strongly recommended as a remedial agent in lieu of cod-liver oil. Hence an Australian Dugong fishery has been established; but its equipped boats' crews are fast sweeping off the once plentiful numbers. The stories of their being found ashore, browsing on land herbage, are not supported by fact; indeed, the inadequate strength of their fore-limbs, the absence of hind extremities, and their unwieldy bodies, prevent them from travelling on land. This is borne out by the statements of the natives of Sumatra to Sir Stamford Raffles, as well as other travellers. The Red Sea Arabs told Dr. Rüppell that they had feeble voices, a fact that other Australian observers have corroborated, although the roaring of Seals has been mistaken for them. In the spring months the males do battle for partners, and the young are born towards the end of the year. Like the Rhytina, the Dugong shows intense maternal affection, for if the young be taken, the mother suffers herself to be speared in following her offspring. In its strange bristly-clad muzzle the Dugong resembles its congeners, but its skull and dentition are singular. Thus, the fore or premaxillary region of the upper jaw is elongated, sharply crooked downwards, and overlaps the very deep lower jaw, which is similarly down-bent. The two opposed surfaces bear the horny tuberculated plates which rub and grind the vegetable food. The dental formula ordinarily is—Incisors, $\frac{1-1}{0-0}$; canines, $\frac{0-0}{0-0}$; molars, $\frac{3-3}{3-3} = 14$. The pair of incisor tusks are lodged in the down-bent upper jaw, and protrude in the male, but in the female they are diminutive, and retained within the bone. Behind them there is a considerable space devoid of canine, and then come three slightly laterally compressed ovoid molars without enamel. The molars, however, may occasionally be five in number, the fore ones dropping out, and others behind taking their places, but not succeeding vertically. In some instances the males have an additional lateral small incisor. Thus as many as twenty-four teeth may be developed, but these are never in use at one and the same time. This peculiar dentition, and the successive displacement of the anterior molars, foreshadows what is regularly found in the Elephants and Mastodons.

The Manatee, or *Lamantin* of the French, inhabits the African and American Continents. In Africa it ranges along the west coast, and ascends the Senegal, Niger, Congo, and other rivers, where it not only frequents the lagoons, but even has been captured in Lake Tchad. This animal is known as *M. senegalensis*. In America two forms are supposed to exist—one, the *M. latirostris*, of Florida, is said to have closer resemblance to the African form than to its fellow-countryman; the other, *M. americanus*, is found in Surinam, Guiana, Jamaica, the Amazon and its tributaries, and, indeed, in the various rivers, bays, and inlets of the tropical American coast. These creatures, like the foregoing, browse upon the aquatic vegetation of the shallow lagoons and river banks, apparently, however, having a preference for fresh-water plants. Their habits and mode of feeding are, in a measure, similar to those of the Dugong and the Rhytina. The full-grown Manatee is from ten to twelve feet in length. Its long body terminates in a thin, wide, shovel-shaped, fibrous, horizontal tail, proportionally broader, but resembling somewhat that of the Beaver. The fore limbs, or flippers, have diminutive flat nails. The skin of the body can be compared only to that of the Elephant, not in colour alone, but also in its coarse, wrinkly texture, and widely-scattered, delicate, but long hairs. Its deep-set, minute eye is surrounded by skin wrinkles. As in the preceding genera, the muzzle is peculiar—a kind of half-moon-shaped swelling above, with deep crossing wrinkles set with short stiff bristles. Beneath this there projects a mass of hard gum, covered with a roughened horny plate. The lower jaw also has a gum plate, underhung by a bristle-clad lower lip. The



MANATEES.

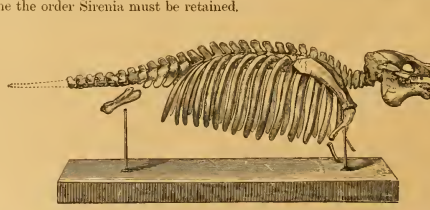
nostrils are two semi-lunar, valve-like slits, at the apex of the muzzle. When the mouth is opened, the marginal inner cheeks are seen to be hair-covered, and the hard, horny palate to be very conspicuous above and below. This remarkable muzzle and mouth are specially adapted to the animal's mode of feeding. Steller long ago remarked that the Rhytina's muzzle was exceedingly prehensile; but in a live Manatee exhibited at the London Zoological Gardens, Professor Garrod observed and has recorded the remarkable manner and use of this lip-structure. In grasping its food, the bristly-clad outer angles of the upper lip at first diverge, and then approximate like a pair of pincers, holding the object firmly, which is then drawn inwards by a backward movement of the lips. The horny pads again on the closing of the mouth further bruise the vegetable matter. In 1866, the Zoological Society sent Mr. Clarence Bartlett to Surinam, to bring home a young Manatee. This suckling, christened "Patcheley," had been obtained when quite a baby by the Indians, and duly transferred to a lakelet, where he had his freedom. Although fishy in form and fondness for the water, he had nevertheless to receive daily a good *quantum* of Cow's milk from a bottle. He soon got fond of the "black Jack," as well as of his keeper. Mr. Bartlett, as wet nurse, had a difficulty in training his charge. Loosely attired, he waded about and coaxed his pet to the water's edge, where, after a stolen suck or two, he permitted himself to be raised partly on his knees, and then sucked away might and main till the bottle was dry. His appetite satisfied, he seemed in high glee, tumbled and rolled about a while, then got quieter, retired to the pool, and slept lazily near the surface. At times his disposition was more rollicking, and Master Patcheley would overturn his nurse into the mud, where the two spluttered and floundered for possession of the bottle. Clusius recounts how a pet "Mato" was kept by a Spanish Governor for twenty-six years: it came at call to the side of the lake to be fed, and would even allow boys to mount on its back while it harmlessly swam about. For long the pursuit of the Manatee has been a favourite amusement with the natives. One instance is related of Indians on the Mosquito shore spearing it from canoes, when the animal darted off as

he felt the weapon, dragging the canoe after it round and round the bight until exhausted. Mr. Alfred R. Wallace says the natives of the Amazon capture them alive, in strong nets, at the mouth of the streams, and afterwards kill them by thrusting wooden plugs up their nostrils. The Manatee has no milk-teeth, though when young there are two rudimentary incisors in each jaw, which afterwards become covered in. Canines are entirely absent, and the molars vary in number from nine to eleven in the upper and lower jaw on each side. Those in the upper series are three-rooted, in the lower series two-rooted; all the molars are broad, square-crowned, and with transverse ridging or cusp structure like that of the Hippopotamus or partly like that of Mastodon. The molar series are never simultaneously in place and use, those in front dropping out and making room for those behind.

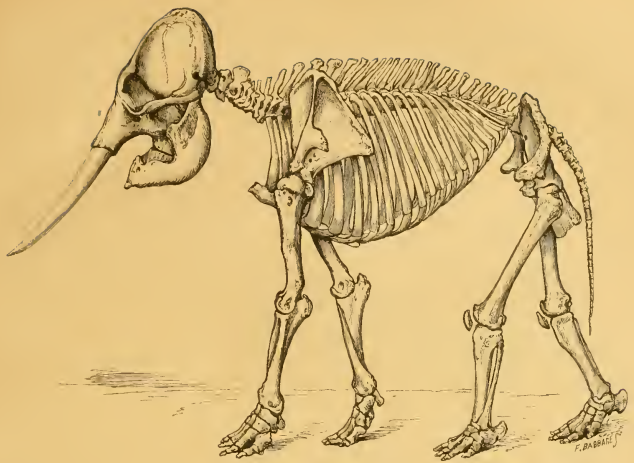
Fossil Sirenia.—The Halitherium is the name given to certain fossil remains which have been found in the Miocene strata of Germany and various other parts of Europe. These remains show that there may have been several species, but all are truly of a Sirenian character. The fossil remains were intermediate, though possibly most closely allied to the Manatee, some of them being slightly larger than this animal. The dentition is unusually interesting, inasmuch as there appear to have been vertical successors; anteriorly there are simple, cylindrical premolars, and posteriorly larger, complex molars, while the somewhat bent-down upper jaw bore tusk-like appendages. But the most peculiar and interesting point in connection with the Halitheria is that they were provided with rudiments of a hind limb, a thigh-bone some few inches in length having been found by the late Professor Kaup, though curiously enough no further vestige of it has since turned up. Judging from the almost complete skeletons obtained, and from comparison with what we know of other Sirenia, the Halitherium must have closely resembled the living Manatee, and possibly have lived in the lagoons and brackish waters of mid-Europe and elsewhere, for in the Eocene and Miocene times these regions, now high and dry, formed watery areas in communication with the ocean.

Besides the foregoing, within the last few years our knowledge of Sirenoids has been considerably augmented by the discovery of other fossil remains indicating several new genera. *Prorastomus* is founded by Owen on a skull from West Indian (doubtful) Tertiary strata. *Crassitherium* is applied by Van Beneden to vertebræ, and part of a skull from deposits near Antwerp. *Felsinotherium* (with but $\frac{6-5}{5-5}$ molar teeth) is a form described by Capellini, from Pliocene beds in Bologna. *Pachyacanthus*, found in strata in the neighbourhood of Vienna, Brandt supposed a Cetacean, but Van Beneden regards it as a Sirenian. The *Rhytiodus*, of Lartet, is based on some fossil teeth bearing resemblances to those of the Dugong. Lastly comes (in the cast of a brain), the still more remarkable *Eotherium* of Owen, from the nummulitic Eocene of Egypt. Some of these fossils are of intense interest, for example, *Prorastomus*, the Tapir-like dentition of which is—Incisors, $\frac{3-3}{3-2}$; canines, $\frac{1-1}{1-1}$; premolars, $\frac{6-5}{5-5}$; molars, $\frac{3-3}{3-3} = 48$. Very interesting also are *Pachyacanthus*, with possibly but six neck vertebræ, like the Manatee; and *Halitherium*, with its hind limb bones, and which also, along with *Felsinotherium*, foreshadows the molar pattern of Hippopotamus. Thus, taking these facts into consideration, together with many other structural peculiarities, Elephant-like and otherwise, and notwithstanding that the Sirenia are aquatic and Whale-like, their structural relationship with the Proboscidea and Ungulata is not so far-fetched as at first sight might seem. But the gap is not yet bridged, and until that is done the order Sirenia must be retained.

James Murie.



MOUNTED SKELETON OF HALITHERIUM, IN THE HEIDELBERG UNIVERSITY MUSEUM



SKELETON OF INDIAN ELEPHANT.

ORDER PROBOSCIDEA (ELEPHANTS).

Order Proboscidea—Antiquity of the Elephant—Referred to in the Bible—Mentioned in the Apocrypha—War Elephants—Their Accoutrements—Hannibal's Elephants—Elephants amongst the Romans—Skull—Dentition—Vertebræ—Odd Delusion about its Legs—Proboscis—Species—THE INDIAN ELEPHANT—Size—Range—Habits—Various Modes of Capture—Keddah—Used as a Labourer or Nurse—Sagacity—White Elephants—THE AFRICAN ELEPHANT—Characteristics—Range—Habits and Haunts—Hunting—Pitfalls—Aggageers Chasing—Elephant Shooting—How the Natives Cut it up—FOSSIL ELEPHANTS AND THEIR ALLIES—Absurd Stories—MAMMOTH—How it was first Found—Story of the Fourth or Benkendorf's Discovery—Range—MASTODON—DINOTHERIUM.

THE Elephants, Horses, Rhinoceroses, Tapirs, Coneys, Pigs, and Hippopotami, were all grouped together by the older naturalists under the order of Pachyderms,* or thick-skinned animals provided with hoofs, but not furnished with a complex stomach for rumination, or chewing of the cud. They are now divided into three different orders—the Proboscidea, Hyracoidea, and Ungulata—which we shall define and describe each in its proper place.

The order Prosboscidea, or animals possessed of a proboscis, or trunk, consists of two living species, the Indian and African Elephant, and two extinct genera known as Dinotherium and Mastodon. The Elephant, from its large size and its singular sagacity, attracted the attention of man in the earliest times, and was always looked upon with feelings of awe and reverence. At the present time the African savage, in the region of the Congo, compasses its death with the mysterious aid of the medicine-man, according to Mr. Winwood Reade, as well as by the ordinary means of hunting. The animal, in early times, was used both for purposes of war and peace, and figures, at the present time, alike in the gorgeous retinues of Indian princes, and ministers to the more humble and more useful services of the husbandman. The ivory furnished by its tusks was known in the remotest antiquity. The first

* παχύς, thick ; δέρμα, skin.

undoubted mention of the Elephant in the Bible relates to the use of ivory, which certainly was employed by the ancient Greeks, Assyrians, and Egyptians early in their history.

King Solomon had a throne of ivory, which was obtained through the Phœnician traders probably from Africa. "For the king had at sea a navy of Tharshish (Cilicia) with the navy of Hiram; once in three years came the navy of Tharshish, bringing gold, and silver, ivory, and apes, and peacocks" (1 Kings x. 22.) Elephants are also mentioned in 2 Chron. ix. 21; and at considerable length in the first and second books of Maccabees, where their use in war is described (1 Macc. vi. 28—30; 43—46).

The Elephants were used in war also by the Indian nations, and were looked upon as most formidable engines in battle. By the aid of these huge creatures, to a large extent, they conquered and held possession of the region of Central Asia west of the Indus.

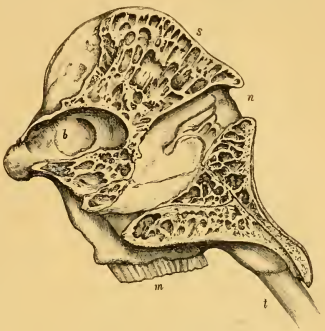
It appears that the relative force of Elephants in a great army corps was one to each chariot of war, with three horsemen and five archers, the latter being perched on the Elephant's back within a houdah of a defensible nature, denominated a castle, the whole forming what was termed a patti, or squad, comprising altogether not more than eleven men, with the drivers or attendants. This shows that in India, which furnished Elephants and the manner of arming them, only four or five archers, with or without the mahout, or driver, were told off to each animal; consequently, when the successors of Alexander introduced them in their wars in Syria, Greece, and Italy, they were not encumbered with more than one or two additional persons before a charge. Indeed, considerable trouble appears to have been taken that a war Elephant should not be nearly as heavily laden as one simply used for carrying burdens; therefore the number of thirty-two soldiers given in Maccabees as seated upon each Elephant must somehow or other be a mistake. These Elephants were well trained, and taught to hold out one of their hind legs horizontally, when it was necessary to mount them in a hurry. They appeared to take considerable delight and satisfaction in the gaudy trappings with which they were usually decorated. In some cases, Elephants have proved more dangerous to the army in whose ranks they were serving than to the enemy, by being suddenly confronted with objects previously unobserved. On such occasions they turn in haste, and spread terror and death into their own ranks. Careful, judicious, and long-continued training was the only remedy against these sudden surprises.

African Elephants probably were never so well trained and subdued as the Indian; nevertheless, they were used by the Carthaginians in the first Punic War (264 241 B.C.) with much success, and to the discomfiture of the Romans. In the second Punic War (218–216 B.C.) Hannibal performed the most astounding and remarkable feats of crossing the Pyrenees, making his way through Gaul, crossing the Alps with thirty-seven Elephants, and defeating the Romans at the Ticinus. Most of the Elephants, however, died shortly afterwards from the excessive coldness of the weather and the fatigue they had undergone. Various accounts are given in Roman history regarding the manner in which the Elephants crossed the Rhone. One story goes that they were assembled together on the bank, and the fiercest of them being provoked by his keeper, pursued him as he swam across the water, to which he had run for refuge, and that the rest of the herd followed. There is, however, more reason to believe that they were conveyed across on rafts. It is said that one raft two hundred feet long and fifty broad was extended from the bank to the river, and was then secured higher up by several strong cables to the bank, that it might not be carried down by the stream. The soldiers then covered it over with earth, so that the animals might tread upon it without fear, as on solid ground. Another raft one hundred feet long, and of the same breadth as the other, was joined to this first. The Elephants were driven along the stationary raft as along a road, and then, the females leading the way, passed on to the other raft, which was fastened to it by lashings. This, on being cut, was drawn by boats to the opposite shore. The Elephants gave no signs whatever of alarm, while they were driven along as it were on a continuous bridge; but a few became infuriated when the raft was let loose, and fell into the river, finding their way, however, safely to the shore.

The trappings and armour of a war Elephant have been described by the author of the "Ayeen Akbery" as follows:—"Five plates of iron, each one cubit long and four fingers broad, are joined together by rings, and fastened round the ears of the Elephant by four chains, each an ell in length; and betwixt these another chain passes over the head, and is secured beneath; and across it are

four iron spikes, with ratasses and iron knobs. There are other chains with iron spikes and knobs, hung under the throat and over the breasts, and others fastened to the trunk; these are for ornament and to frighten Horses. Pakher is a kind of steel armour that covers the body of the Elephant; there are other pieces of it for the head and proboscis."

History informs us that when Timour, or Tamerlane, attacked the dominions of the Sultan Mahmoud (A.D. 1399), the Elephants, of which the latter had a considerable number, caused great terror and alarm; and that the preparations made by Timour to overcome the Elephants were of the most extraordinary nature, for not only did he surround his camp with a deep ditch and bucklers, but also had Buffaloes tied together round the ramparts, with huge brambles on their heads, which were to be set on fire at the approach of the Elephants. The forces of the Sultan, besides the Elephants, consisted of a large number of horse and foot soldiers armed with swords and poisoned daggers. Attendant upon the Elephants were men armed with fire, melted pitch, and other horrid missiles, to be hurled at the invaders. The Elephants also, besides being armed, were decorated with all sorts of articles, such as cymbals and bells, and other objects likely to create a noise and confusion. Notwithstanding all this terrific display, Timour's forces fought with great courage, actually defeating the Sultan's forces, and putting the Elephants to flight, the unfortunate creatures undergoing severe usage to their trunks by the swordsmen, who appeared soon to find out the more vulnerable parts. It is said that the trunks of many of the Elephants were left scattered on the battle-field, having been severed by the sword. The belief in the invincibility of the Elephants was then for ever gone; and it is even said of Timour's grandson, then quite a boy, that he himself wounded an Elephant, and drove it in as a captive to his grandfather's camp.

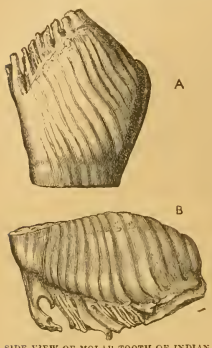


SECTION OF SKULL OF INDIAN ELEPHANT.
s, Air Sinuses; *n*, Nostrils; *b*, Brain; *m*, Molar; *t*, Tusk.

We are told that in ancient times the number of Elephants annually brought from Africa to Rome, to be trained for the cruel and disgusting practice of fighting in the theatre, was very great. It is said of Pompey that, at the dedication of his theatre, no less than five hundred Lions, eighteen Elephants, and a number of armed men, were all at one time in the circus. In the second consulate of Pompey (54 B.C.) Elephants were opposed, in the circus, to Getulian archers; and, according to Pliny, this exhibition was characterised by some uncommon circumstances. One of the Elephants, although furious from a wound, is recorded to have seized upon the shields of his adversaries, and to have thrown them in the air with a peculiar movement, doubtless the effect of training, which caused the shields to whirl round before their fall. It is also stated that an Elephant, having been killed by a thrust of a javelin through the eye, the others rushed forward in a general charge to save him, and that on their coming with terrific force against the iron railings, the latter gave way, and several of the spectators were either injured or killed. On another occasion, when some Elephants, with other wild animals, were fighting together in the arena, the spectators so compassionated the unfortunate creatures, who were raising their trunks to heaven and roaring piteously, as if imploring aid of the gods, that they rose from their seats, and, disregarding Pompey's presence, demanded that the Elephants might be spared. The destruction of Elephants in sport by the Romans, as well as the increased demands of the ivory trade, have caused the African Elephants to disappear from those regions of Northern Africa which they once inhabited. In the days of the Carthaginians, the animal was found north of the Sahara, where at present it is unknown.

The skull of the Elephant is remarkable for its great size, and the comparatively small cavity occupied by the brain. The latter is small in comparison to the size of the animal, in bulk not much

exceeding that of man. Although the bones of the skull are so large, they are not solid, their interior being occupied by hollows divided from each other by thin partitions, by which means the skull is rendered lighter than might be supposed; and altogether it forms a beautiful instance of a provision for increasing the surface for attachment of muscles, without being too great a burden to its possessor. The skull of the Indian Elephant is of a much more pyramidal and less shapely form than that of the African.



SIDE VIEW OF MOLAR TOOTH OF INDIAN ELEPHANT.
A, Upper; B, Lower.

The dentition in the Elephants presents several points of considerable interest. In the Indian species, the males alone have well-developed incisors; while both sexes of the African species are provided with them. These—more commonly known as tusks—grow to an enormous size, sometimes reaching the weight of from a hundred and fifty to two hundred pounds. There are no lower incisors, and only two of the molar teeth are to be seen at each side of the jaw at one time. There are six of these in each side, or four-and-twenty in all, in the lifetime of the Elephant, and these present a gradual increase in size as they successively appear. These teeth move forward into their working place in the jaw in regular succession, from behind forwards, each being pushed out by its successor as it gradually becomes worn away. The teeth are worn away, not merely by the food on which the animal lives, but also by the particles of sand and grit entangled in the roots of the herbs torn up for food, and their wear is compensated by the growth and development of the succeeding teeth. In a state of captivity, however, where the food is much more free from extraneous substances than in a state of nature, the teeth are not worn away fast enough to make room for the development of the successors, and it therefore frequently happens that the tooth is deformed by a piling over of the plates of which it is composed.

The molar or grinding-teeth of the Elephant are for the most part buried in the socket, and present little more than a surface for mastication above the gum. Each is composed of a number of transverse perpendicular plates, built up of a body of dentine, covered by a layer of enamel, and this again by a layer of cement, which fills the interspaces of the plates, and binds together the divisions into one solid mass. Each of these enamel plates, however, in the perfect tooth is united at the base. When these plates of enamel—which stand out in the transverse plates on account of their superior hardness, and cause the grinding surface to be uneven—are worn out, the animal either dies of indigestion, or more often becomes weak, and falls a prey to wild beasts.

LAST LOWER TOOTH OF AFRICAN ELEPHANT.

The difference between the grinders of the Indian and African Elephants is well defined. In the former, the transverse ridges of enamel are narrower, more undulating, and more numerous than in the African, in which latter species the ridges are less parallel, and enclose lozenge-shaped spaces. The cervical vertebræ form a short and stiff series, allowing but a limited motion of the head from side to side, a more extended action being rendered unnecessary by the flexibility of the trunk. With regard to the dorsal vertebræ, they appear to vary in number in both species. In the African species the number varies from twenty to twenty-one, and in the Indian species from nineteen to twenty. As might be expected, the limbs of the Elephant are massive and powerful. In ancient times it was a popular delusion that the legs of an Elephant possessed no joints; and even now people are to be found who believe that the Elephant's joints move in a contrary direction to that of other quadrupeds. Shakspere evidently enjoyed the

LAST LOWER TOOTH OF INDIAN ELEPHANT.

popular belief. In *Troilus and Cressida*, Ulysses, speaking of the stiff demeanour of Ajax towards Achilles, says :—

> "The Elephant hath joints, but none for courtesy,
> His legs are legs for necessity, not for flexure."

And so in Chapman's drama (1605) of *All Fools* we read :—

> "I hope you are no Elephant, you have joints."

These ideas originated from the peculiar gait of the Elephant.

The shape of the Elephant is so familiar to every one that it is only necessary to remark that the ponderous body, clad in a thick and almost hairless skin, has the fore-quarters higher than the hinder parts, and that the thigh in the hind leg is long and straight when the animal is standing. The knee is visible below the body, and bends so as to bring the foot in the rear. On comparing an Elephant and a Carnivore, and their skeletons as well, the arrangement of the joints of the hind quarters will be noticed to be different. In fact, the bend of the Elephant's knee gives the gait of the huge creature an appearance unlike that of any other animal. It stands on the ends of its five toes, each of which is terminated by comparatively small hoofs, and the heel-bone is a little distance from the ground. Beneath comes the wonderful cushion, composed of membranes, fat, nerves, and blood-vessels, besides muscles, which constitutes the sole of the foot. The fore-foot is larger than the hind one, and as the creature does not require to climb, or to lift its fore-limb very high, there is no collar-bone. In the young there is more hair on the body than might have been expected, and they have a set of milk teeth.

TRUNK OR PROBOSCIS OF ELEPHANT.
A, Muscles and Tendons; B, Transverse Section.

The brain is greatly convoluted on the surface, but the little brain, or cerebellum, is not covered by the brain proper.

The trunk or proboscis of the Elephant, from which the name of the order to which this animal belongs is derived, is certainly a remarkable and wonderful organ. It is really a prolongation of the nose, of a sub-conical form, consisting of two tubes divided by a septum. At the extremity on the upper side, above the opening of the nostrils, is a lengthened process to be looked upon in the light of a finger; beneath this finger is a tubercle, opposable to it, and acting, so to speak, as a thumb. With this organ, which is nearly eight feet in length, of considerable stoutness, and extreme sensibility, the Elephant is enabled to uproot or shake trees, lift a cannon, or pick up a pin. By its aid, food and water are carried to the mouth, and when necessary, it can be converted into a syringe or a shower-bath. The length of the organ does away with the necessity of a long neck, a short and muscular neck being absolutely required for the support of the enormous head and tusks.

The principal characters of the Indian species, as compared with the African, are the small ears, concave forehead, small eye, lighter colour, and the possession of four instead of three nails or hoofs on the hind foot. There is also a very remarkable difference in the teeth, those of the Indian species being built up of a series of plates much more numerous and more closely packed together than in the African species.

THE INDIAN ELEPHANT.*—There are but two living species of Elephant—the Indian (*Elephas indicus*) and the African (*Elephas africanus*), although some naturalists have considered the Elephant

* *Elephas indicus.*

of Sumatra and Ceylon to be a distinct species, and Schlegel has separated it from both the Indian and African, and defined it as *E. sumatrensis*. It has been, however, shown by Dr. Falconer and others, that although certain differences are to be noticed, they are not of sufficient value to create a new species; but they are still of sufficient importance to form a variety.

In size, notwithstanding the differences of opinion to be found between certain writers on this subject, some saying that the Indian and others that the African Elephant is the larger, it seems perfectly clear that there cannot be much difference between the two species, and that the maximum height is about eleven feet.

The Indian Elephant (where the progress of civilisation has not interfered with it) is found over the greater part of the forest lands of India, Ceylon, Burmah, Siam, Cochin-China, the Malay Peninsula, and Sumatra; but it is doubtful whether it is indigenous to any of the other islands of the Eastern Archipelago. Unlike the African species, to a certain extent, it appears to have a partiality for coolness and shade; indeed, Sir J. Emerson Tennent says that "although found generally in warm and sunny climates it is a mistake to suppose that the Elephant is partial either to heat or to light. In Ceylon, the mountain tops, and not the sultry valleys, are its favourite resort. In Oovah, where the elevated plains are often crisp with the morning frost, and on Pedura-talla-galla, at the height of upwards of eight thousand feet, they are found in herds, whilst the hunter may search for them without success in the hot jungles of the low country."

In some parts of the country Elephants are exceedingly destructive to crops of grain. And in various parts of India, notwithstanding the care and trouble taken to watch the crops, they do much injury. When the rice approaches maturity it is necessary to place watchers throughout the night in places which they frequent. Stages are erected on posts twelve or fourteen feet high, and on one side of the stage a small shed is made for the watchmen, two of whom always mount the same stage. One feeds a fire kept constantly burning on the open part, while the other in his turn is allowed to sleep, and when any Elephants come into the field, he is awakened and both join in shouting and making all the noise they can with sticks and drums.

The food of the Elephant appears to be considerably varied, and chosen by the animal with no small amount of daintiness; sweet-tasting fruits, seeds, and blossoms he has the greatest partiality for, and in their selection much destruction is occasioned by a herd of these huge animals. Tennent says that in Ceylon, where the food of the Elephant is most abundant, the animal never appears to be in a hurry to eat; but amuses himself with playing with the leaves, shaking the trees, tearing the bark, and now and then pausing to eat, altogether taking the whole affair in a very leisurely sort of way. He is especially fond of the fruit of the palmyra palm, and never fails to make his appearance in the districts where these trees grow when the fruit begins to fall to the ground. Although the amount of food consumed by Elephants in their wild state is very large, there is reason to believe that many stories told of their extraordinary eating capabilities are much exaggerated. It by no means follows that because an Elephant in a tame state will eat so much bread, turnips, hay, &c., that it consumes the same quantity of its natural food in a wild state. The Elephants are believed to drink nightly in very hot weather, but in cool weather only every third or fourth day, and for this purpose they travel long distances to their watering-places, even as far as ten or twenty miles, refreshing themselves by a bath and a drink at the same time when they reach their destination.

Various modes are used for catching Elephants; but the usual practice is to drive them into what is termed a keddah. The keddah is a large area surrounded by a broad ditch, and towards the entrance is a similar construction to the main body, but smaller, acting as a sort of funnel, into which the Elephants enter when driven from the jungle, and which assists in getting them into the keddah itself.

On discovering a large herd of Elephants, a body of men, often numbering six or eight thousand, are collected to surround them, carrying all sorts of instruments likely to create a noise, such as firearms, drums, trumpets, &c., Elephants being exceedingly alarmed by any unusual noises. By this means they are gradually driven into the keddah, sometimes from a distance of thirty or forty miles, which frequently occupies some days. When the Elephants find themselves fairly entrapped, they become violent and use their utmost endeavours to break down the barriers.

Formerly, it was the practice to starve these captured Elephants into submission; now, however, by means of two tame ones, trained for the purpose, they can be captured without injury, one by one,

INDIAN ELEPHANT.

and afterwards bound to a tree. To accomplish this the trained animals are sent into the enclosure, and on a wild Elephant being singled out, the two trained ones place themselves one on each side, and attract its attention while the attendants are occupied in binding its legs, which having been satisfactorily accomplished, the captive is dragged to a tree and fastened firmly, where it remains until reduced to submission and obedience by kindness and good feeding.

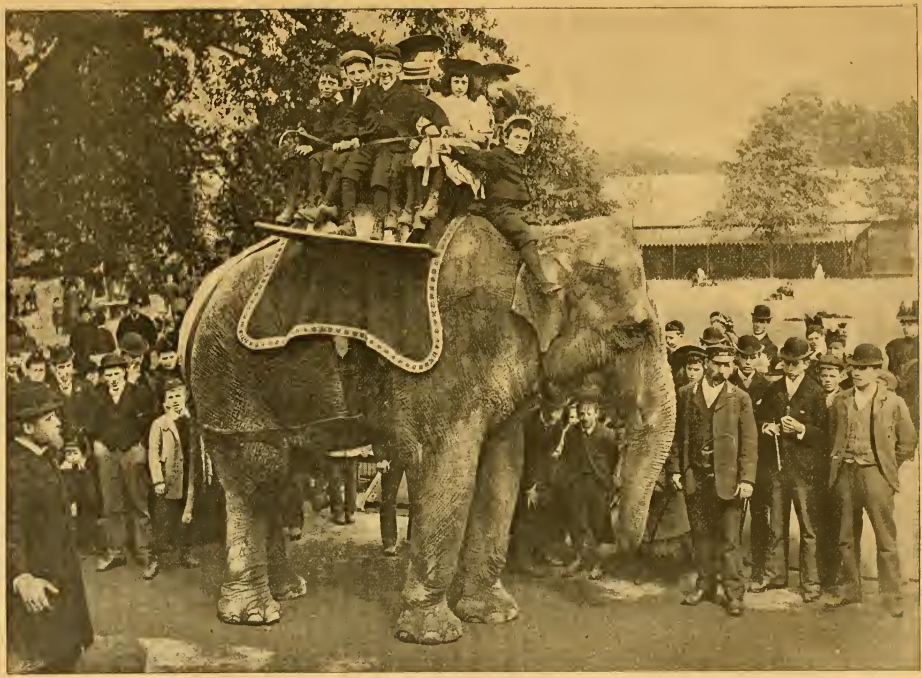
"The vast jungles in the south-eastern portion of the Mysore territory are infested with herds of wild Elephants, whose depredations on the adjacent lands have retarded agriculture to a serious extent. A project was set on foot by Mr. G. P. Sanderson, a young and energetic officer in the service of the Mysore Government, to convert these Elephants to some use by capturing and taming them. Mr. Sanderson's design was to drive a herd into a strongly embanked channel leading out of the Honhole river, escape being cut off at one end by a deep ditch, and the other opening on the river, guarded by Elephant chains supported by strong posts. On the 9th June, 1874, the Elephants being reported in the neighbourhood, a large party of natives, led by Mr. Sanderson and two other ardent sportsmen, hurried to the spot, and quietly drove the animals towards the channel. The leading Elephant being pushed from behind by his companions, tumbled over the bank, and the latter soon followed. This having been effected, the embankment was quickly strengthened, large fires lighted at intervals along it, and watchers placed for the night. The next point was to move the Elephants into a still smaller enclosure, which was prepared close by. It was funnel-shaped at the mouth, and formed of trunks of trees, firmly fixed in the ground, the snare being disguised by branches and brush-wood. Over the neck of the funnel, so to speak, a drop formed of two large cocoa-nut trees lashed together was suspended by a rope, to be severed at a stroke when the Elephants were all in. The herd, terrified by firebrands, rockets, and guns, were driven towards the keddah, and led by a troublesome tusker, who had long kept the others at bay, marched majestically one by one through the gate. After a short pause, owing to a stand being made by a few of the most refractory, the last of the herd went in with a rush, closely followed by a frantic native waving a firebrand. An officer sitting ready on a branch of a tree now cut the rope, and the drop fell amid loud cheers, thus capturing the rich prize of fifty-three Elephants, which were brought out one by one with the assistance of tame Elephants. The latter advance in a body and gradually cut one off from the herd. While amusing it, and distracting its attention, its legs are warily tied by trained men. After this no difficulty is encountered. The capture described included twelve valuable tuskers, and its value was estimated at over £4,000."*

Indian Elephants are also sometimes captured by means of pitfalls formed in a similar manner to those used in Africa. There is, however, one great objection to this mode of capture, which is, that the animal is rendered very liable, from the heavy fall it sustains, of being seriously hurt, and indeed injuries thus received have often proved fatal.

Another way of catching these animals in some districts of India is by means of the lasso. Two trained females are procured for the purpose; these are provided with a long rope which is fastened to their girdle, and then coiled on their backs. Its end forms a noose, which a man, who sits on the back of the trained female, throws round the neck of the wild Elephant; the tame one then walks away until the captured one is almost strangled. In the meantime, the people, assisted by another tame female, endeavour to fasten ropes to his legs, and he is dragged to a place where there are trees, to which he is fastened until he becomes tame. The Elephants caught in this manner are usually small, and the majority, for some reason or other, die, probably from the rough usage they have undergone.

Elephant shooting, especially in Ceylon, was considered to be the acme of sport; but from the number that were wantonly destroyed, an order was issued by the Governor prohibiting their destruction. The Elephant is invaluable as a labourer; its assistance in road-making, bridge-building, ploughing, piling logs, lifting weights, and other similar operations, is of the utmost service. Even as a nurse for young children, its services, we are told, are sometimes required. An Indian officer relates that he has seen the wife of a mahout (for the followers often take their families with them to camp), give a baby in charge of an Elephant, while she went on some business, and has been highly amused in observing the sagacity and care of the unwieldy nurse. The child, which, like most

* *Graphic*, June 12, 1875.



ELEPHANT IN THE ZOOLOGICAL GARDENS, LONDON.

(*From a Photograph by Symmons and Co., Chancery Lane, expressly taken for this work.*)

children, did not like to be at rest in one position, would, as soon as left to itself, begin crawling about, in which exercise it would probably get among the legs of the animal, or entangled in the branches of the trees on which he was feeding, when the Elephant would in the most tender manner disengage his charge, either by lifting it out of the way with his trunk, or by removing the impediments to its free progress. If the child had crawled to such a distance as to verge upon the limits of his range (for the animal was chained by the leg to a peg driven in the ground), he would stretch out his trunk and lift it back as gently as possible to the spot whence it had started.

Endless other stories are told of the sagacity of this noble animal, some of them, however, probably not ungarnished with considerable exaggeration. However, this creature does undoubtedly possess a most wonderful amount of intelligence, and it is believed that the Indian species, both in sagacity and docility, surpasses the African.

The White Elephants, held in reverence in Siam, and extremely rare, are not distinct from the rest; they are merely albinoes, or white varieties, and are to be viewed in the same light as white Blackbirds or white Sparrows.

The African Elephant* is distinguished at once from the Indian species by the great size of its ears, its larger eye, convex forehead, darker colour of its skin, and by possessing only three instead of four nails or hoofs in the hind foot. It is indigenous to Africa, being found south of the Sahara as far as Cape Colony, and from the Indian Ocean to the Atlantic. It formerly lived north of the Sahara, and in the Pleistocene age of geologists was found in Europe, in Italy, and in Spain, to which points it probably crossed at the time when the submerged barriers between Sicily and Africa, and Gibraltar and Africa, were above the level of the water.

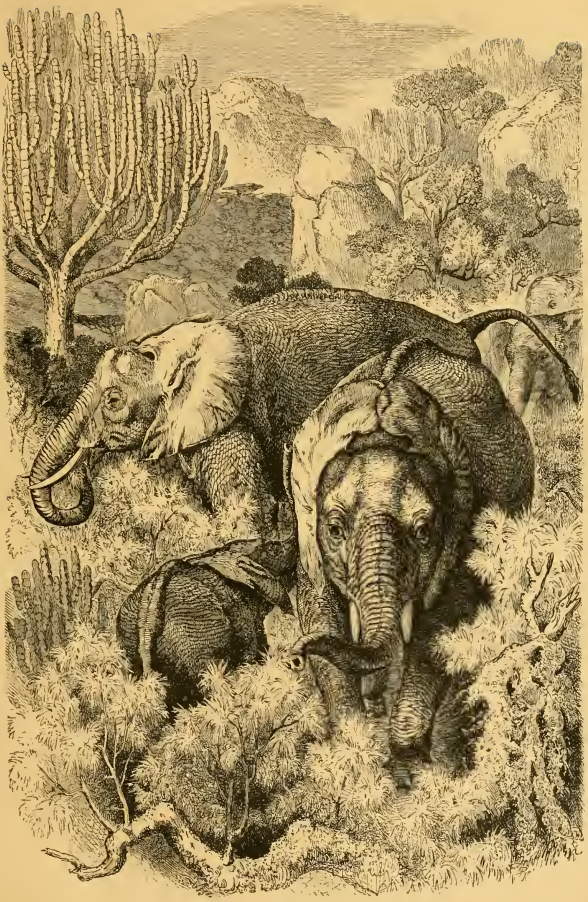
Unlike the Indian species, both the males and the females are provided with tusks. The African differs also considerably in his habits, for while the Indian enjoys coolness and shade, the African is more or less exposed to the burning sun.

According to Sir Samuel Baker, "in Africa the country being generally more open than in Ceylon, the Elephant remains throughout the day either beneath a solitary tree, or exposed to the sun in the vast prairies, where the thick grass attains a height of from nine to twelve feet. The general food of the African Elephant consists of the foliage of trees, especially of mimosas. Many of the mimosas are flat-headed, about thirty feet high, and the richer portion of the foliage confined to the crown. Thus, the Elephant, not being able to reach to so great a height, must overturn the tree to procure the coveted food. The destruction caused by a herd of Elephants in a mimosa forest is extraordinary, and I have seen trees uprooted of so large a size that I am convinced no single Elephant could have overturned them. I have measured trees four feet six inches in circumference, and about thirty feet high, uprooted by Elephants. The natives have assured me that they mutually assist each other, and that several engage together in the work of overturning a large tree. None of the mimosas have tap roots; thus the powerful tusks of the Elephants applied as crowbars at the roots, while others pull at the branches with their trunks, will effect the destruction of a tree so large as to appear invulnerable."

The following account by Gordon Cumming, which, on some points as to the habits and haunts of the African Elephant does not agree with that of Sir Samuel Baker, may be explained by the different nature of the country hunted by him:—"The Elephant is widely diffused through the vast forests, and is met with in herds of various numbers. The male is much larger than the female. He is provided with two enormous tusks. These are long, tapering, and beautifully arched; their length averages from six to eight feet, and they weigh from sixty to a hundred pounds each. In the vicinity of the Equator the Elephants attain to a larger size than to the southward; and I am in possession of a pair of tusks of the African bull Elephant, the larger of which measures ten feet nine inches in length, and weighs one hundred and seventy-three pounds.

"Old bull Elephants are found singly or in pairs, or consorting together in small herds, varying from six to twenty individuals. The younger bulls remain for many years in the company of their mothers, and these are met together in large herds of from twenty to a hundred individuals. The food of the Elephant consists of the branches, leaves, and roots of the trees, and also of a variety of bulbs, of the situation of which he is advised by his exquisite sense of smell. To obtain these he turns up the ground with his tusks, and whole acres may be seen thus ploughed up. Elephants consume an

* *Elephas africanus.*



AFRICAN ELEPHANT.

immense quantity of food, and pass the greater part of the day and night in feeding. Like the Whale in the ocean, the Elephant on land is acquainted with, and roams over, wide and extensive tracts. He is extremely particular in always frequenting the freshest and most verdant districts of the forests, and when one district is parched and barren, he will forsake it for years and wander to great distances in quest of better pasture.

"The Elephant entertains an extraordinary horror of man, and a child can put a hundred of them to flight by passing at a quarter of a mile to windward; and when thus disturbed they go a long way before they halt. It is surprising how soon these sagacious animals are aware of the presence of a hunter in their domains. When one troop has been attacked, all the other Elephants frequenting the district are aware of the fact within two or three days, when they all forsake it, and migrate to distant parts, leaving the hunter no alternative but to unspan his wagons, and remove to fresh ground.

"This constitutes one of the greatest difficulties which a skilful Elephant-hunter encounters. Even in the most remote parts, which may be reckoned the head-quarters of the Elephant, it is only occasionally, and with inconceivable toil and hardship, that the eye of the hunter is cheered by the sight of one. Owing to habits peculiar to himself, the Elephant is more inaccessible and much more rarely seen than any other game quadruped, excepting certain rare Antelopes. They choose for their resort the most lonely and secluded depths of the forest, generally at a very great distance from the rivers and fountains at which they drink. In dry and warm weather they visit these waters nightly; but in cool and cloudy weather they drink only once every third or fourth day. About sundown the Elephant leaves his distant midday haunt, and commences his march towards the fountain, which is probably from twelve to twenty miles distant. This he generally reaches between the hours of nine and midnight, when, having slaked his thirst and cooled his body by spouting large volumes of water over his back with his trunk, he resumes the path to his forest solitudes. Having reached a secluded spot, I have remarked that full-grown bulls lie down on their broadsides about the hour of midnight and sleep for a few hours. The spot which they usually select is an ant-hill, and they lie around it with their backs resting against it. These hills, formed by the white Ants, are from thirty to forty feet in diameter at their base. The mark of the under tusk is always deeply imprinted in the ground, proving that they lie upon their sides. I never remarked that females had thus lain down, and it is only in the more secluded districts that the bulls adopt this practice; for I observed that, in districts where the Elephants were liable to frequent disturbance, they took repose standing on their legs beneath some shady tree. Having slept, they then proceed to feed extensively. Spreading out from one another, and proceeding in a zigzag course, they smash and destroy all the finest trees in the forest which happen to lie in their course. The number of goodly trees which a herd of bull Elephants will thus destroy is utterly incredible. They are extremely capricious, and on coming to a group of five or six trees they break down, not unfrequently, the whole of them, when, having perhaps only tasted one or two small branches, they pass on and continue their wanton work of destruction. I have repeatedly ridden through forests where the trees thus broken down lay so thick across one another that it was almost impossible to ride through the district; and it is in situations such as these that attacking the Elephant is attended with most danger. During the night they will feed in open plains and thickly-wooded districts, but as day dawns, they retire to the densest covers within reach, which nine times in ten are composed of the impracticable wait-a-bit thorns; and here they remain drawn up in a compact herd during the heat of the day. In remote districts, however, and in cool weather, I have known herds to continue pasturing throughout the whole day."

The African Elephant is not now hunted for domestic purposes, but for the sake of the flesh and of the ivory; and its death is a grand affair for the natives, since it affords opportunity not merely for a feast, but for obtaining fat for internal and external uses. There are various methods of killing them. Pitfalls are most common, and are generally placed in the neighbourhood of a drinking-place, the natives showing great skill in felling trees, so as to turn the Elephants into them. According to Sir Samuel Baker, "the pits are usually about twelve feet long, and three feet broad, by nine deep; these are artfully made, decreasing towards the bottom to the breadth of a foot. The general Elephant route to the drinking-places being blocked up, the animals are diverted by a treacherous path towards the water, the route intersected by numerous pits, all of which are carefully concealed by sticks and straw, the latter being usually strewn with Elephants' dung, to create a natural effect.

Should an Elephant during the night fall through the deceitful surface, his foot becomes jammed in the bottom of the narrow grave, and he labours shoulder-deep, with two feet in the pitfall so fixed that extrication is impossible. Should one animal be thus caught, a sudden panic seizes the rest of the herd, and in their hasty retreat one or more are generally victims to the numerous pits in the vicinity. Once helpless in the pit, they are easily killed with lances."

The same author also relates that sometimes the Elephant-hunters, or aggageers, of the Hamram tribe, use swords for killing Elephants. They follow the tracks of the animal, "so as to arrive at their game between the hours of 10 and 12 A.M., at which time it is either asleep or extremely listless, and easy to approach. Should they discover the animal asleep, one of the hunters would creep stealthily towards the head, and with one blow sever the trunk while stretched upon the ground; in which case

AGGAGEERS HUNTING AN ELEPHANT.

the Elephant would start upon his feet, while the hunters escaped in the confusion of the moment. The trunk severed would cause a loss of blood sufficient to insure the death of the Elephant within about an hour. On the other hand, should the animal be awake upon their arrival, it would be impossible to approach the trunk. In such a case, they would creep up from behind, and give a tremendous cut at the back sinew of the hind leg, about a foot above the heel. Such a blow would disable the Elephant at once, and would render comparatively easy a second cut to the remaining leg. These were the methods adopted by poor hunters, until by the sale of ivory they could purchase Horses for the higher branch of the art. Provided with Horses, the party of hunters should not exceed four. They start before daybreak, and ride slowly throughout the country in search of Elephants, generally keeping along the course of a river until they come upon the tracks where a herd, or a single Elephant, may have drunk during the night. When once upon the track, they follow fast towards the retreating game. The Elephants may be twenty miles distant, but it matters little to the aggageers. At length they discover them, and the hunt begins. The first step is to single out the bull with the largest tusks; this is the commencement of the fight. After a short hunt, the Elephant turns upon his

pursuers, who scatter and fly from his headlong charge until he gives up the pursuit; he at length turns to bay when again pressed by the hunters. It is the duty of one man in particular to ride up close to the head of the Elephant, and thus to absorb its attention upon himself. This insures a desperate charge. The greatest coolness and dexterity are then required by the hunter, who, now the *hunted*, must so adapt the speed of his Horse to the pace of the Elephant that the enraged beast gains in the race, until it almost reaches the tail of the Horse. In this manner the race continues. In the meantime, two hunters gallop up behind the Elephant, unseen by the animal, whose attention is completely directed to the Horse almost within his grasp. With extreme agility, when close to the heels of the Elephant, one of the hunters, while at full speed, springs to the ground with his drawn sword, as his companion seizes the bridle, and with one dexterous two-handed blow he severs the back sinew. He immediately jumps out of the way, and remounts his Horse; but if the blow is successful, the Elephant is hamstrung, and, as it cannot run rapidly on three legs, is easily killed."

The Fans in the neighbourhood of the Gaboon settlements, according to Mr. Winwood Reade, are in the habit of employing the same mode of capturing Elephants as the natives of India, namely, by enticing them within an enclosure or fence of posts and rails, where they are afterwards killed with cross-bows, spears, and trade-guns.

Elephant shooting, although not unattended by danger, appears to be on the whole accomplished with considerable success, five or six Elephants having been killed occasionally in a very short space of time by one man; and many are the tales of hair-breadth escapes related to us by Gordon Cumming, Tennent, Baker, and others. But it appears the forehead-shot, so much in favour in shooting Indian Elephants, does not answer with the African species, the form of the head and the position of the tusks preventing the bullet from reaching the brain.

"The only successful forehead-shot," says Sir S. Baker, "that I made at an African Elephant was shortly after my arrival in the Abyssinian territory, on the Settite River; this was in thick, thorny jungle, and an Elephant from the herd charged with such good intention that, had she not been stopped, she must have caught one of the party. When within about five yards of the muzzle of my rifle, I killed her dead by a forehead-shot with a hardened bullet, and we subsequently recovered the bullet in the *vertebræ of the neck!* This extraordinary penetration led me to suppose that I should always succeed as I had done in Ceylon, and I have frequently stood the charge of an African Elephant until close upon me, determined to give the forehead-shot a fair trial, but I have *always* failed, except in the instance now mentioned. It must be borne in mind that the Elephant was a female, with a head far inferior in size and solidity to that of the male. The temple-shot, and that behind the ear, are equally fatal in Africa as in Ceylon, provided the hunter can approach within ten or twelve yards; but altogether the hunting is far more difficult, as the character of the country does not admit of an approach sufficiently close to guarantee a successful shot. In the forests of Ceylon, an Elephant can be stalked to within a few paces, and the shot is seldom fired at a greater distance than ten yards. Thus accuracy of aim is insured; but in the open ground of Africa an Elephant can seldom be approached within fifty yards, and should he charge the hunter escape is most difficult. I never found African Elephants in good jungle, except once, and on that occasion I shot five quite as quickly as we should kill them in Ceylon."

Gordon Cumming gives us the following information as to how the natives cut up an Elephant for food and other purposes. "The rough outer skin is first removed, in large sheets, from the side which lies uppermost. Several coats of an under skin are then met with. This skin is of a tough and pliant nature, and is used by the natives for making water-bags, in which they convey supplies of water from the nearest 'vley,' or fountain (which is often ten miles distant), to the Elephants. They remove this inner skin with caution, taking care not to cut it with the assegai; and it is formed into water-bags by gathering the corners and edges, and transfixing the whole on a pointed wand. The flesh is then removed in enormous sheets from the ribs, when the hatchets come into play, with which they chop through, and remove individually, each colossal rib. The bowels are thus laid bare; and in the removal of these the leading men take a lively interest and active part, for it is throughout and around the intestines that the fat of the Elephant is mainly found.

"There are few things which a Bechuana prizes so highly as fat of any description. They will go an amazing distance for a small portion of it. They use it principally in cooking their sun-dried

biltong, and they also eat it with their corn. The fat of the Elephant lies in extensive layers and sheets in his inside, and the quantity which is obtained from a full-grown bull, in high condition, is very great. Before it can be obtained, the greater part of the intestines must be removed. To accomplish this, several men eventually enter the immense cavity of his inside, where they continue mining away with their assegais, and handing the fat to their comrades outside until all is bare. While this is transpiring with the sides and intestines, other parties are equally active in removing the skin and flesh from the remaining parts of the carcass.

"The natives have a horrid practice on these occasions of besmearing their bodies, from the crown of the head to the sole of the foot, with the black and clotted gore; and in this anointing they assist one another, each man taking up the fill of both his hands, and spreading it over the back and shoulders of his friend. Throughout the entire proceeding, an incessant and deafening clamour of many voices and confused sounds is maintained, and violent jostling and wrestling are practised by every man, elbowing the breasts and faces of his fellows, all slippery with gore, as he endeavours to force his way to the flesh through the dense intervening ranks, while the sharp and ready assegai gleams in every hand. The angry voices and gory appearances of these naked savages, combined with their excited and frantic gestures and glistening arms, presented an effect so wild and striking that, when I first beheld the scene, I contemplated it in the momentary expectation of beholding one-half of the gathering turn their weapons against the other.

"The trunk and feet of the Elephant are considered a great delicacy, and are baked in holes in the earth, which have been heated by fires burnt in them. The flesh of the Elephant is then cut into strips, varying from six to twenty feet, and about two inches in breadth and thickness. It is then placed on poles, and allowed to dry in the sun for two or three days, after which it is packed into bundles, each man carrying off his share to his wife and family."

FOSSIL ELEPHANTS AND THEIR ALLIES.

The Proboscidea, represented, as we have already seen, by two species only among living animals, both of which are met with in and near the tropical regions of the Old World, in the fossil state are met with over nearly the whole of the Old World, and of the New; and are divided into three genera—Elephas, Mastodon, and Dinotherium.

The teeth and bones of these creatures found in Europe were assigned in the sixteenth, seventeenth, and eighteenth centuries to giants, and many are the stories which were commonly reported about them—as, for example, that of the giant of Dauphiné, in the reign of Louis XIV. His remains were discovered by a surgeon, who stated that they were enclosed in an enormous sepulchre covered with a stone slab, bearing the inscription *Teutobochus rex;* and that in the vicinity there were also found coins or medals, all of which showed the remains to be those of a giant king of the Cimbri, who fought against Marius. However, the original owner of these bones, though not of the coins, was proved to have been an Elephant.

The story of Teutobochus is even excelled by that of another giant, called the giant of Lucerne, whose remains when dug up were examined by a celebrated Professor of Basle, who described them as of human origin, and was skilful enough to put them together so as to resemble a giant no less than twenty-six feet high. For some time the deluded people of Lucerne paid homage to this Elephantine prodigy, until the scales were removed from their eyes by Blumenbach, who pronounced to their astonished senses that the giant, as it lay in state at the Jesuits' College, was but the skeleton of an Elephant.

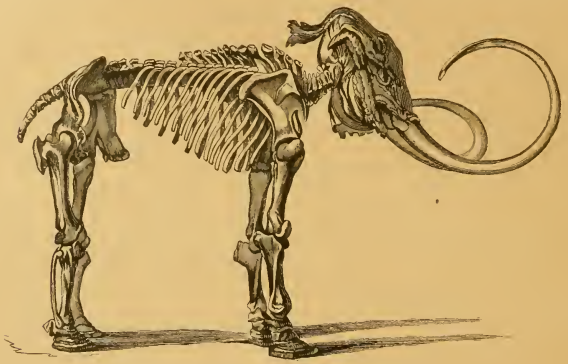
The Tertiary or third great period into which the geologists divide the life-history of the earth consists of the following divisions:—Eocene, Miocene, Pliocene, Pleistocene, Prehistoric, and Historic, and it is in the Pliocene stage that the Elephant first appears in Europe and America.

The large, straight-tusked Elephant (*E. meridionalis*), with large grinders composed of thick and coarse plates, is found ranged over the whole of France, Italy, Britain, and Germany in those times, in company with another narrow-toothed species, also with straight tusks, described by Dr. Falconer under the name of *Elephas antiquus.*

By far the best known and most important of these huge creatures is the far-famed MAMMOTH

(*Elephas primigenius*). This Elephant has been found frozen in Siberian soil beautifully preserved, with the hair and tissues in so good a condition that microscopical sections have been made of them.

The story of finding the first Mammoth imbedded in ice has been often told, but is still of sufficient interest to be related again. A Tungoosian fisherman, named Schumachoff, about the year 1799, was proceeding, as is the custom of fishermen in those parts when fishing proves a failure, along the shores of the Lena in quest of Mammoth tusks, which have been there found in considerable abundance. During his rambles, having gone farther than he had done before, he suddenly came face to face with a huge Mammoth imbedded in clear ice. This extraordinary sight seems to have filled him with astonishment and awe; for instead of at once profiting by the fortunate discovery, he allowed several years to roll on before he summoned courage to approach it closely, although it was his habit to make stealthy journeys occasionally to the object of his wonder. At length, seeing, it is presumed, the terrific monster made no signs of eating him up, and that its tusks would bring him a considerable sum of money, he allowed



SKELETON OF MAMMOTH.

the hope of gain to overcome his superstitious scruples. He boldly broke the barrier of ice, chopped off the tusks, and left the carcass to the mercy of the Wolves and Bears, who, finding it palatable, soon reduced the huge creature to a skeleton. Some two years afterwards a man of science was on the scent, and although so late in at the death, found a huge skeleton with three legs, the eyes still in the orbits, and the brain uninjured in the skull.

In addition to the peculiarity of the Mammoth having its body covered with long woolly hair, it was also remarkable for the extraordinary formation of its enormous tusks, which curved upwards, forming a spiral.

The eminent Siberian explorer, Dr. Middendorf, in 1843, met with a second instance of the Mammoth being preserved to such a degree that the bulb of the eye is now in the same museum as the skeleton of a Mammoth found by Mr. Adams in 1803. Middendorf found it in latitude 66° 30 N., between the Obi and the Yenisei near the Arctic Circle. In the same year he also found a young animal of the same species in beds of sand and gravel, at about fifteen feet above the level of the sea, near the river Taimyr, in latitude 75° 15′, associated with marine shells of living Arctic species, as well as with the trunk of the larch. But the fourth, and by far the most important, discovery of a Mammoth is described by an eye-witness of its unearthing, and the record is so valuable in its bearings that we give it at some length. A young Russian engineer, Benkendorf by name, employed by

the Government in a survey of the coast of the mouth of the Lena and Indighirka, was despatched up the latter stream, in 1846, in command of a small iron steam-cutter. He writes the following account, which we translate, to a friend in Germany :—

"In 1846 there was uncommon warm weather in the north of Siberia. Already in May unusual rains poured over the moors and bogs, storms shook the earth, and the streams carried not only ice to the sea, but also large tracts of land, thawed by the masses of warm water fed by the southern rains. . . . We steamed on the first favourable day up the Indighirka ; but there were no thoughts of land. We saw around us only a sea of dirty brown water, and knew the river only by the rushing and roaring of the stream. The river rolled against us trees, moss, and large masses of peat, so that it was only with great trouble and danger we could proceed. At the end of the second day, we were only about forty versts [one verst = 1,166⅔ yards English] up the stream. Some one had to stand with the sounding-rod in hand continually, and the boat received so many shocks that it shuddered to the keel. A wooden vessel would have been smashed. Around us we saw nothing but the flooded land. For eight days we met with the like hindrances, until at last we reached the place where our Yakuts were to have met us. Farther up was a place called Ujandina, whence the people were to have come to us, but they were not there, prevented evidently by the floods. As we had been here in former years we knew the place. But how it had changed ! The Indighirka, here about three versts wide, had torn up the land and worn itself a fresh channel, and when the waters sank we saw to our astonishment that the old river-bed had become merely that of an insignificant stream. This allowed me to cut through the soft earth, and we went reconnoitring up the new stream which had worn its way westwards. Afterwards we landed on the new shore, and surveyed the undermining and destructive operation of the wild waters, that carried away with extraordinary rapidity masses of soft peat and loam. It was then that we made a wonderful discovery. The land on which we were treading was moorland, covered thickly with young plants. Many lovely flowers rejoiced the eye in the warm beams of the sun, that shone for twenty-two out of the twenty-four hours. The stream rolled over and tore up the soft wet ground like chaff, so that it was dangerous to go near the brink. While we were all quiet, we suddenly heard under our feet a sudden gurgling and stirring, which betrayed the working of the disturbed water. Suddenly our jäger [hunter], ever on the look-out, called loudly, and pointed to a singular and unshapely object, which rose and sank through the disturbed waters. I had already remarked it, but not given it my attention, considering it only drift wood. Now we all hastened to the spot on the shore, had the boat drawn near, and waited until the mysterious thing should again show itself. Our patience was tried, but at last, a black, horrible, giant-like mass was thrust out of the water, and we beheld a colossal Elephant's head, armed with mighty tusks, with its long trunk moving in the water, in an unearthly manner, as though seeking for something lost therein. Breathless with astonishment, I beheld the monster hardly twelve feet from me, with his half-open eyes yet showing the whites. It was still in good preservation.

"'A Mammoth ! a Mammoth !' broke out the Tschermomori, and I shouted 'Here quickly ! chains and ropes !' I will pass over our preparations for securing the giant animal, whose body the water was trying to bear from us. As the animal again sank we waited for an opportunity to throw the ropes over his neck. This was only accomplished after many efforts. For the rest we had no cause for anxiety, for after examining the ground I satisfied myself that the hind legs of the Mammoth still stuck in the earth, and that the water would work for us to unloosen them. We therefore fastened a rope round his neck, threw a chain round his tusks, that were eight feet long, drove a stake into the ground about twenty feet from the shore, and made chain and rope fast to it. The day went by quicker than I thought for, but still the time seemed long before the animal was secured, as it was only after the lapse of twenty-four hours that the waters had loosened it. But the position of the animal was interesting to me ; it was standing in the earth, and not lying on its side or back as a dead animal naturally would, indicating by this the manner of its destruction. The soft peat or marsh land on which he stepped thousands of years ago gave way by the weight of the giant, and he sank as he stood on it feet foremost, incapable of saving himself, and a severe frost came and turned him into ice, as well as the moor which had buried him ; the latter, however, grew and flourished, every summer renewing itself ; possibly the neighbouring stream had heaped plants and sand over the dead body.

God only knows what causes had worked for its preservation; now, however, the stream had once more brought it to the light of day, and I, an ephemera of life compared with this primeval giant, was sent here by heaven just at the right time to welcome him. You can imagine how I jumped for joy. . . . . Picture to yourself an Elephant with a body covered with thick fur, about thirteen feet in height, and fifteen in length, with tusks eight feet long, thick and curving outwards at their ends, a stout trunk of six feet in length, colossal limbs of one foot and a half in thickness, and a tail naked up to the end, which was covered with thick tufty hair. The animal was fat and well grown; death had overtaken him in the fulness of his powers. His parchment-like, large, naked ears lay fearfully turned up over the head; about the shoulders and the back he had stiff hair, about a foot in length, like a mane. The long outer hair was deep brown and coarsely rooted. The top of the head looked so wild, and was so penetrated with pitch, that it resembled the rind of an old oak-tree. On the sides it was cleaner, and under the outer hair there appeared everywhere a wool, very soft, warm, and thick, and of a yellow brown colour. The giant was well protected against the cold. The whole appearance of the animal was fearfully wild and strange. It had not the shape of our present Elephants. As compared with our Indian Elephants, its head was rough, the brain case low and narrow, but the trunk and mouth were much larger. The teeth were very powerful. Our Elephant is an awkward animal, but compared with this Mammoth it is as an Arabian steed to a coarse ugly Dray-horse. I could not divest myself of a feeling of fear as I approached the head; the broken, widely-opened eyes gave the animal an appearance of life, as though it might move in a moment and destroy us with a roar. . . . . The bad smell of the body warned us that it was time to save of it what we could, and the swelling flood, too, bade us hasten. First of all we cut off the tusks, and sent them to the cutter. Then the people tried to hew the head off, but, notwithstanding their good will, this was slow work. As the belly of the animal was cut open the intestines rolled out, and then the smell was so dreadful that I could not overcome my nauseousness, and was obliged to turn away. But I had the stomach separated and brought on one side. It was well filled, and the contents instructive and well preserved. The principal were young shoots of the fir and pine; a quantity of young fir cones also, in a chewed state, were mixed with the mass."

This most graphic account affords a key for the solution of several problems hitherto unknown. It is clear that the animal must have been buried where it died, and that it was not transported from any place farther up stream to the south, where the climate is comparatively temperate. The presence of fir-spikes in the stomach proves that it fed on the vegetation which is now found at the northern part of the woods, as they join the low, desolate, treeless, moss-covered tundra, in which the body lay buried, a fact that would necessarily involve the conclusion that the climate of Siberia, in those ancient days, differed but slightly from that of the present time. Before this discovery, the food of the Mammoth had not been known by direct evidence. The circumstances under which it was brought to light enable us to see how animal remains could be entombed in the frozen soil without undergoing decomposition, which Baron Cuvier and Dr. Buckland agreed in accounting for by a sudden cataclysm, and Sir Charles Lyell by the hypothesis of their having been swept down by floods from the temperate into the arctic zone. In this particular case, the marsh must have been sufficiently soft to admit of the Mammoth sinking in; while shortly after death the temperature must have been lowered, so as to arrest decomposition, up to the very day on which the body arose under the eyes of M. Benkendorf, in the exceptionally warm year of 1846, when the tundra was thawed to a most unusual depth, and converted into a morass permeable by water. Had any Mammoths been alive in that year, and had they strayed beyond the limits of the woods into the tundra, some would in all human probability have been engulfed; and, when once covered up, the normal cold of winter would suffice to prevent the thaw of the carcases, except in extraordinary seasons, such as that in which this one was discovered. Probably many such warm summers intervened since its death, but as it was preserved from the air, they would not accelerate putrefaction to any great degree. In this way the problem of its entombment and preservation may be solved by an appeal to the present climatal conditions of Siberia. The difficulty of accounting for such vast quantities of remains in the Arctic Ocean, especially in the Lächkow Islands off the mouth of the Lena, is also explained by this discovery, as well as the association of marine shells with the remains of the Mammoth. The body was swept away by the swollen flood of the Indighirka, along with many other waifs and strays, and no doubt by this time is adding

to the vast accumulation in the Arctic Sea. It was seen by a mere chance, and must be viewed as an example of the method by which animal remains are swept seaward. In all probability, the frozen morass in which it was discovered is as full of Mammoths as the peat-bogs of Ireland are of Irish Elk, and have been the main source from which the Arctic rivers have obtained their supply of animal remains. The remains of the Mammoth are met with in incredible numbers in the river deposits of Middle and Northern Europe, as well as in those of North America, showing that in ancient times the animal ranged over a tract of land extending from the Mediterranean to the Arctic Sea, and from Behring Strait to the Gulf of Mexico. It is also met with in the caves in Middle Europe, having been dragged into them by the Hyænas, or having fallen a prey to the ancient hunter. We owe, indeed, to the skill of the latter an incisive sketch of the animal as he appeared to the inhabitants of Auvergne, in the remote geological period known as Pleistocene; the long, hairy mane, and spirally-curved tusks, are faithfully depicted by the artist, and, were it not for the strange chance which has preserved to us the whole animal in the frozen ice-cliffs of Siberia, would have seemed to us merely imaginative details. In another example, also from the caves of Auvergne, the Mammoth is represented with his mouth open, and his trunk lifted up in the attitude of charging.

MAMMOTH (*Restored*).

Remains of other extinct species of Elephants are found; one, which is of exceedingly small stature, standing not much higher than from two and a half to three feet, has been discovered in the bone-caves of Malta. The genus MASTODON, which in many respects resembles the true Elephants, differs from them in the formation of the teeth, the grinders being much simpler, more tubercular, and with crowns free from cement. In most cases, also, there were two small tusks in the lower jaw, as well as those in the upper. In Europe they appear in the Miocene and Pliocene strata, and in America they survived into the Pleistocene. The most extraordinary-looking, perhaps, of the fossil Proboscidea, and that furthest removed from the living Elephants, is the DINOTHERIUM, of the Miocene age. It possessed no tusks in the upper jaw, but its lower jaw was armed with two long curved tusks, projecting downwards. It probably possessed the habits of the Elephant, and these tusks may have been used for uprooting trees, or hooking down boughs, so as to obtain the leaves and shoots for food.

W. BOYD DAWKINS.
H. W. OAKLEY.

ORDER HYRACOIDEA (CONIES).

What is the Coney?—Mention in the Bible—General Appearance—Real Place—Range—Varieties—Coney of the Bible—Cape Coney—Ashkoko of Abyssinia—Mr. Winwood Reade's Account of the Habits of the Cape Coney—Skull, Dentition, Ribs, &c.

THE order of animals known to naturalists as Hyracoidea (derived from the Greek ὕραξ, a Shrew, and εἶδος, form) contains but one genus, called Hyrax. Belonging to this genus are but two or three species of small animals, which, however, are of considerable interest, both from their peculiar organisation, and from their mention four times in the Bible under the name of Shaphan, improperly translated Coney, which has given rise to considerable controversy, as to what animal was meant. Some persons considered, and naturally enough, that Coney meant nothing more or less than the Rabbit; but now no doubt exists, as has been shown from its characters and habits, that the animal referred to is the Daman, or *Hyrax syriacus*.

The following are the passages literally rendered, in which the Hyrax is mentioned in the Bible: "Likewise the Coney, because he cheweth the cud, and divideth not the hoof; he shall be unclean unto you" (Leviticus xi. 5). "But these ye shall not eat of them that chew the cud, and of them that divide and cleave the hoof only; the Camel, nor the Hare, nor the Coney; for they chew the cud, but divide not the hoof; therefore they shall be unclean unto you" (Deuteronomy xiv. 7). "The high mountains are for the Goats; the rocks are a refuge for the Conies" (Psalms civ. 18). "The Conies are but a feeble folk, yet make they their houses in the rocks" (Proverbs xxx. 26). With regard to the first passage, although the Hyrax certainly does not chew the cud, the peculiar way in which it moves its jaws, as it sits perched in a ruminating manner, so to speak, on some ledge of rock, would naturally suggest to the ignorant that it really was chewing the cud. In the third quotation, we read "the rocks are a refuge for the Conies." This exactly suits the Hyrax, which is always found inhabiting rocky situations. The last extract also agrees with the known habits of the Hyrax. Here it is alluded to as being one of the four animals on earth who are small, but very wise. These four are the Ant, the Locust, the Spider, and the Coney. All travellers who have noticed the Hyrax are agreed that it is a most wary and crafty animal, and that the utmost caution is required even to obtain a view of it; and to kill one requires a most skilful and practised sportsman.

The Hyrax is a little animal clothed with a brownish fur, of about the size of an ordinary Rabbit, to which, indeed, it has some resemblance. It is allied to the Rhinoceros, the Tapir, and Rodents; but the whole form of the skeleton approaches more nearly to that of the two former than it does to any known species of the latter. Linnæus, however, and other authors, classed it with the Rodents; but Cuvier, seeing that it more nearly approached the characters of the old group of animals called Pachydermata (thick-skinned animals), placed it with them. Now, however, it is assigned by Prof. Huxley to an order of its own named Hyracoidea; but it still is a doubtful question as to what should be done with it.

Of the several animals forming the genus, one, the *Hyrax syriacus*, the Coney of the Bible, is found from the coast of the Red Sea northwards through Syria, by Lebanon, and southwards into Arabia and Ethiopia. Another species, *Hyrax capensis*, the Cape Coney, is found at the Cape and east coast of Africa, extending from Abyssinia down the east coast southwards. Two other species are described from West Africa; but both probably belong to one genus.

Bruce, in his "Travels in Abyssinia," tells us that the Ashkoko, which is understood to be the same as the Daman (*Hyrax syriacus*), is found in Ethiopia, in the caverns of the rocks, and under the large stones in the Mountain of the Sun, behind the queen's palace at Koscam. He also informs us that it is of common occurrence in many other rocky places of Abyssinia, and he says that it does not make holes like Rabbits or Rats, because its toes are not adapted for so doing, and that it is a very timid and gentle creature, stealing along a few paces, and then stopping, as if to see that the coast is clear.

Bruce also states that apparently the same species inhabits Mount Libanus, and the rocks of Cape Mohammed, which divides the Elanitic from the Heroopolitic Gulf, or Gulf of Suez from that of Akabah, and that the only difference he saw was in the greater size and fatness of those of the Mountain of the Sun.

"The *Hyrax capensis*," writes Mr. Reade, "is found living at the Cape of Good Hope, inhabiting

CONIES.

the hollows and caves of the rocks, both on the hill-sides and on the sea shore, a little above high-water mark. It seems to live in families, and in its wild state is remarkably shy. In the cold weather it is fond of coming out of its hole and warming itself in the sun on the side of a rock, and in summer it enjoys the breeze on the top of the hills, but in both instances, as well as when it feeds, a sentinel

is always placed on the look-out, generally an old male, which gives notice of any approach of danger by a long shrill cry.

"Its principal food is the young tops of shrubs, especially those which are aromatic, but it also eats herbs, grass, and the tops of flowers. To eat it tastes much like a Rabbit. It is recorded that one gentleman caught two young ones which he kept for some time. They became very tame, and as they were allowed the run of the house would follow him about, jump on to his lap, or creep into his bed for the sake of the warmth. One brought home by Mr. Hennah would also run inquisitively about the cabins, climbing up and examining every person and thing, but startled by any noise, it would run away and hide itself. When shut up for long, it became savage and snarled and tried to bite at everything that came in its way. This animal, both when wild as well as when tame, is very cleanly in its habits. From its faintly crying in its sleep it may be supposed that it dreams. It has also been heard to chew its food at night. When tame it will eat a variety of things, the leaves of plants, bruised Indian corn, raw potatoes, bread, and onions, and will greedily lick up salt.

SKULL OF CONEY.

The one brought home by Mr. Hennah was very sensible of the cold, for when a candle was placed near its cage, it would come as close as possible to the bars, and sit still to receive as much warmth as it could. I am inclined to think that the female does not produce more than two young ones at a time, from having observed in several instances but two following the old ones. Its name at the Cape is the Dasse, which is, I believe, the Dutch for a Badger."

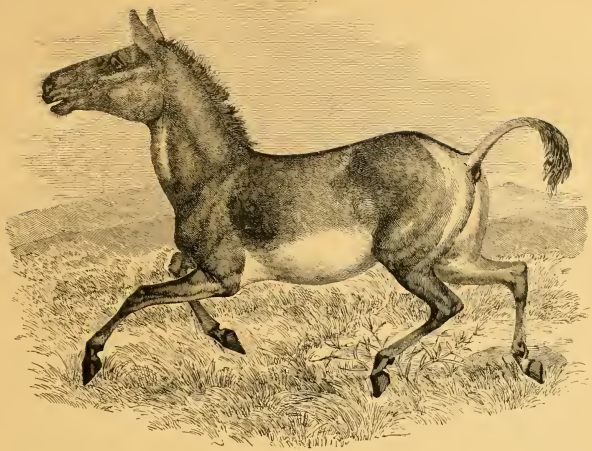
In structure, the skull of the Hyrax approaches more nearly to that of the Ungulata (animals with hoofs), especially to that of the Rhinoceros, than it does to that of any of the Rodents. The nose of the Hyrax, however, not having any horn to support, the nasal bones are not thickened, as they are in the Rhinoceros. There is a marked distinction between the maxillary, or upper jaw-bones of the Hyrax and those of the Rodents, the extent of the former being much smaller. In the former, also, there are two parietal bones, as compared with one in the latter. The joint, or condyle of the lower jaw, differs from that of the Rodents, in which it is compressed longitudinally, while in the Hyrax it is compressed transversely, as in the Ungulata, being also applied to a plane surface of the temporal bone, whereby a motion more or less horizontal is permitted.

The Hyrax has no canine teeth. The upper incisors resemble those of Rabbits and Hares in number, which are four in the adult, and those of Rodents generally in the possession of persistent pulps. In shape they approach more to the form of the canines of the Hippopotamus by terminating in a point. The number of lower incisors is also four, and they are procumbent somewhat like those of the Hog. The grinders, both in number and form, resemble those of the Rhinoceros.

DENTITION OF CONEY.

With regard to the number of ribs, the Hyrax approaches nearer to the Ungulata and Proboscidea than it does to the Rodents. It departs from the former in the number of the vertebræ and form of the pelvis; but again approaches them in the form of the femora (thigh bones), and also in the formation of the feet: the toes are four in front and three behind, as in the Tapir, and they are supplied with hoofs, or rounded hoof-like nails. They are without collar-bones (clavicles). The body of the Hyrax is covered with thick hair, which is here and there beset with bristles, and the tail is represented by a mere tubercle. No remains of the Hyrax have yet been found in a fossil state.

W. Boyd Dawkins.
H. W. Oakley.



KIANG, OR WILD ASS OF TIBET.

ORDER UNGULATA (HOOFED QUADRUPEDS).

CHAPTER I.

PERISSODACTYLA—THE EQUIDÆ, OR HORSE FAMILY.

Order *UNGULATA* — Divisions — PERISSODACTYLA — Characteristics—EQUIDÆ — Species — Descent — First Domestic Horses in Europe —Used for Food— Mention of the Horse in the Bible—War-Chariots—the Horse among the Greeks and Romans—in Britain—Attempts to Improve the Breed—Colour—Teeth—"The Mark"—the Foot—Skull Disease from the Gad-fly—RACE-HORSE—TROTTING-HORSE OF AMERICA—DRAY HORSE—SHETLAND PONY—ARAB AND BARB—PERSIAN HORSE—WILD HORSES IN AMERICA—Habits—Byron's "Mazeppa"—Capture and Breaking in—WILD HORSES IN AUSTRALIA—THE ASS—Species—Stripes—Characteristics — MULE AND HINNY—WILD ASS OF TIBET—ONAGER—WILD ASS OF ABYSSINIA—ZEBRAS—BURCHELL'S ZEBRA—QUAGGA—FOSSIL EQUIDÆ—Distribution—HIPPARION.

THE hoofed quadrupeds are so called because they possess hoofs, from which fact the order Ungulata takes its name,* and they include animals of widely different appearance, such as the Horse, Rhinoceros, Giraffe, Camel, and the like. They are classified into two sub-orders, according to the odd or even number of toes, those having an odd number on the hind foot being termed the Perissodactyla,† such as the Horse, Tapir, and Rhinoceros; and the Artiodactyla,‡ or animals with an even number of toes on their hind feet, such as the Pig, Hippopotamus, Sheep, Ox, Deer, and the like. All the animals belonging to the order feed upon vegetables, with the exception of the Pig and Peccary, which are omnivorous; and none of them are provided with sharp-edged cutting back teeth, adapted for dividing flesh, such as are found in the Carnivora—Lions, Tigers, Wolves, and Hyænas. The odd-toed Ungulates come first.

SUB-ORDER PERISSODACTYLA.

The odd-toed animals consist of three living families—(1) The Equidæ, or Horses; (2) the Tapiridæ, or Tapirs; (3) the Rhinocerotidæ, or Rhinoceroses; and two extinct families—(1) the Palæo-

* From the Latin *unguis*, *ungula*, a hoof. † περισσός, uneven; δάκτυλος, toe. ‡ ἄρτιος, even; δάκτυλος, toe.

theridæ, or Palæotheres (παλαιός, old ; θηρίον, beast) ; and (2) the Macraucheniadæ (μακρός, long ; αὐχήν, neck). In all the animals belonging to the group, the number of dorso-lumbar vertebræ is not fewer than twenty-two, the third or middle digit of each foot is symmetrical, the femur or thigh-bone has a third trochanter, or knob of bone on the outer side, and the two facets on the front of the astragalus or ankle-bone are very unequal. When the head is provided with horns, they are skin-deep only, without a core of bone, and they are always placed in the middle line of the skull, as in the Rhinoceros.

In the Perissodactyla the number of toes is reduced to a minimum. Supposing, for example, we compare the foot of a Horse with one of our own hands, we shall see that those parts which correspond with the thumb and little finger are altogether absent, while that which corresponds with the middle finger is largely developed, and with its hoof, the equivalent of our nail, constitutes the whole foot. The small splint bones, however, resting behind the principal bone of the foot represent those portions (metacarpals) of the second and fourth digits which extend from the wrist to the fingers properly so called, and are to be viewed as traces of a foot composed of three toes in an ancestral form of the Horse, which we shall discuss presently. In the Tapir, the hind foot is composed of three well-developed toes, corresponding to the three middle toes in man, and in the Rhinoceros both feet are provided with three toes formed of the same three digits. In the extinct Palæotherium also, the foot is constituted very much as in the Rhinoceros.

FAMILY I.—EQUIDÆ, THE HORSE-TRIBE.

The Equidæ, or Horse-tribe, comprise several living and many extinct species. Three living members are restricted, in a state of nature, to Asia and Africa, and are divided into the true Horses, which have horny patches or callosities on the inner sides of both pairs of limbs—above the wrist in the fore, and on the inner side of the metatarsus on the hind limbs—and the Asses, which possess such callosities only on the fore-limb. With the latter are classed the Zebras and the Quaggas. All the

TARPAN.

WILD HORSE OF TARTARY.

existing and some of the extinct members of the family, are characterised by the feet being formed of one perfectly developed digit or toe only, the others being present in a rudimentary shape as the splint-bones. In the extinct Hipparion, however, and Anchithere, as we shall see presently, the accessory toes are well developed.

The true Horses are represented by one well-established species, *Equus caballus*, from which all the other races, or varieties, are descended, by a process of selection under the care of man, and these vary in size, proportion of parts, and colour, as much as any two closely-allied species of wild animals can be said to be defined from each other. According to Mr. Darwin, no aboriginal or truly Wild Horse is positively known to exist, for the Wild Horses of the East may probably be descended from those which have escaped from the service of man. In all probability the wild animal has been exterminated by the hand of man in those countries which it formerly inhabited, and in which it has left its remains to attest its former presence.

The Tarpan and Wild Horse of Tartary, which are to be found in thousands in the great treeless plains, present us with the nearest examples of the stock from which the Domestic Horses were probably derived. Their colour is mouse-coloured, with a stripe along the back. The best and strongest of these are caught by the Tartars by the aid of the lasso, and by the help of Falcons, which are trained to settle on the Horse's head, and flutter their wings, so as to take its attention away from the approaching hunter.

The first Domestic Horses known in Europe were introduced at a very early period, long before

the dawn of history, in the period known by the archæologists as that of polished stone, or that in which man had not yet acquired a knowledge of the metals bronze or iron. They are met with in the ruins of those wonderful pile dwellings, which lie at the bottom of the Swiss lakes, in association with the remains of the Pig, Sheep, Goat, Short-horned Ox, large Ox of the Urus type, and Dog, and evidently belonged to a race of farmers, by whom they were introduced into Europe. Bones occur in the camps, sepulchres, and habitations of this age, throughout the whole of the Continent, and of Great Britain and Ireland. In all probability they were used at this time not for riding or for driving, but for food. In the succeeding, or bronze age, however, they were employed for purposes of riding, as may be seen from the discovery of the bronze bits, which have been met with in France and Italy. They were probably introduced by a race of nomads, who no doubt brought Horses with them from the steppes of Central Asia.

According to Colonel Hamilton Smith, "so little is known of the primitive seat of civilisation—the original centre, perhaps, in Bactria, in the higher valleys of the Oxus, or in Cashmere, whence knowledge radiated to China, India, and Egypt—that it may be surmised that the first domestication of the *post-diluvian* Horse was achieved in Central Asia, or commenced nearly simultaneously in several regions where the wild animals of the Horse form existed."

The Horse was universally used for food by man before the historic period, and would be used now in Europe more generally than it is, were it not for an edict of the Church in the eighth century. During the Roman occupation of Britain, it formed a large part of the diet of the inhabitants; by the Scandinavians it was eaten in honour of Odin. As Christianity prevailed over the heathen worship, it was banished from the table. It appears, however, that it was used in England as late as the year 787, after it had been prohibited in Eastern Europe. The ecclesiastic rule, however, was not always obeyed, for the monks of St. Gall, in Switzerland, not only ate Horse-flesh in the eleventh century, but returned thanks for it in a metrical grace, which has survived to our times on account of its elegance and beauty.

It is somewhat remarkable that the Horse is, with few exceptions, mentioned in the Bible only in connection with war, and that there is a wonderful absence of detail with regard to its nature and habits otherwise than for the purposes it served in battle. That the Horse spoken of in Scripture was nearly identical with the Arab Horse of to-day there can be little doubt, if we examine the various sculptures and paintings which are handed down to us, and which speak of the faded glories of Egypt and Assyria. The first account we have of the Horse is during the famine in Egypt that was foretold by Joseph, and here we find that it was evidently an Egyptian animal. "And they brought their cattle unto Joseph; and Joseph gave them bread in exchange for Horses, and for the flocks, and for the cattle of the herds, and for the Asses; and he fed them with bread for all their cattle for that year."

The courage and fiery nature of the Arab Horse, particularly fitting it for use in the wars of ancient times, were evidently well understood. In the Book of Job (xxxix. 19-25) we read:—"Hast thou given the Horse strength? hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? the glory of his nostrils is terrible. He paweth in the valley, and rejoiceth in his strength: he goeth on to meet the armed men. He mocketh at fear, and is not affrighted; neither turneth he back from the sword. The quiver rattleth against him, the glittering spear and the shield. He swalloweth the ground with fierceness and rage: neither believeth he that it is the sound of the trumpet. He saith among the trumpets, Ha, ha! and he smelleth the battle afar off, the thunder of the captains, and the shouting."

The Hebrews in the patriarchal age did not require Horses, and for a long time after their settlement in Canaan did not use them, probably partly on account of the nature of the country, which was hilly, and partly because they were prohibited on account of their hostility to the Egyptians. The Horses of the kings David and Solomon were derived from Egypt. In the reign of the latter, a Horse was worth 150 shekels of silver, and a chariot six hundred. The former was the first to establish a force of cavalry and chariots.

From the very earliest ages known to the historian in Egypt and Assyria, Horses were used for purposes of war, and were yoked in pairs, and sometimes in threes, to the war-chariots in which the kings and great captains rode. They are generally depicted as being of upright or

Hog manes. Horsemen were also employed by both nations, but they were evidently not thought so important as Horses and chariots for warlike purposes.

In the earlier period of Greek history, and in Homeric times, the art of riding was utterly unknown to the Greeks, for if a man was seen on horseback he was supposed to be a Centaur. Down to 500 B.C. riding was not practised by the Greeks, although it was well known to the Barbarians. As we get close to the year mentioned, we hear of Persian cavalry; for instance, the great question with regard to the battle of Marathon (490 B.C.) is, What were the Persian cavalry doing? And at the same period we find that cavalry had become an important arm in Northern Greece. Throughout all the times of Greek pre-eminence, Horses were mainly used for the purpose of the chariot. The utmost care and attention were devoted to their breeding, and the greatest expense incurred in the maintenance of a stud, which was a luxury possible only to the very richest persons, and almost entirely beyond the means of private individuals. The greatest horsekeepers, and consequently winners in the chariot-races, were almost entirely princes and ruling families.

After 450 B.C. we begin to hear of riding and of cavalry in Greece proper, side by side with charioteers. Books were written on the art, one of which, from the pen of Xenophon, is still extant.

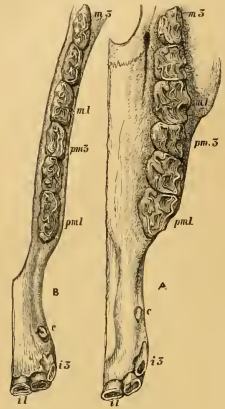
The case is totally different when we turn to the history of Rome during the same period. In the early regal times, and in the first centuries of the Republic, cavalry was the most important arm of the military service. It was naturally composed of the aristocracy, who alone could bear the expense of a Horse. It was only when a rich middle class had sprung up, and were denied the aristocratic privilege of serving on horseback, that the heavy-armed infantry, which in later times won all the great Roman victories, came first into existence. As they increased, the cavalry decreased in importance, and the typical Roman soldier was what was called in mediæval times a man-at-arms.

The native breeds of Horses in Britain, before the Roman conquest, are known to us merely from a reference to them by Cæsar, that they were powerful and well suited for purposes of war by their stature and training. They were used in the battles of the Romans, yoked to the chariots. They were evidently considered of great importance, since they appear on some of the early British coins—as, for example, those of Cunobelin. After the conquest of Britain by the Angles, Jutes, and Saxons, the Horses demanded more attention than before. Athelstan thought the preservation of the native breed of sufficient importance to call for a legal enactment to prevent the export of Horses, excepting as presents. Saddle-horses were employed, according to the testimony of Bede, in England in the early part of the seventh century, and from the notices in the Anglo-Saxon Chronicle it is evident that they were frequently used by the Danes for purposes of transport from one part of the country to another; and in the song of the fight of Maldon, we read of Goderic flying from the field on a Horse, on which his lord had ridden down to the battle.

The first attempt on record to improve the native breed, by the introduction of foreign blood, was by the importation of "running Horses" from Germany in the time of Athelstan; in whose reign also many Spanish Horses were imported. William the Conqueror, who owed his success in the Battle of Hastings to his cavalry, paid great attention to the English breed. In his time, Professor Bell tells us, "Roger de Belesme, Earl of Shrewsbury, imported the elegant and docile Spanish Horse, and bred from it on his estates in Powisland; and it is recorded that the Horses of that part of Wales were long celebrated for their swiftness, a quality which they had doubtless derived from this happy mixture of blood. The heavy panoply of mail, however, with which the warriors of this and of succeeding ages at once protected and loaded both themselves and their steeds, sufficiently attests that the cavalry must have been mounted on Horses of great strength and size; and there is no doubt that, until the universal employment of firearms rendered such a protection in a great measure unavailable, the speed and figure of the War Horse must have been sacrificed to the qualities of power and endurance. The beautiful Horses on which many of our light cavalry regiments are now mounted, although endowed with considerable strength, would have been crushed beneath the weight of metal by which both the knight of olden time and his Horse were so heavily laden."

King John paid great attention to the improvement of the breed for agricultural purposes; and to him, according to Youatt, we are indebted for our Draft Horses. He imported no less than a hundred Flanders stallions, which probably laid the foundation of the strength and size which are the eminent characteristic of our Horses of war and labour. Edward III. was a zealous patron of the

course, and in his reign the heavy native breed was crossed with lighter Horses of Spanish origin, the offspring of the Arabs, which had been introduced by the Moors. From this time forwards, great pains were taken by the English sovereigns to improve the breeds; races were regularly established in various parts of the kingdom, and various enactments were passed to secure excellence. James I. gave as much as five hundred pounds—an enormous sum, according to the value of money in those times—for an Arabian; and in the Protectorate of Cromwell, Horses were introduced from the south-east and from Morocco, by which beauty of form, and a degree of swiftness before unknown, were added to the stoutness which had hitherto characterised English Horses. In the time of Charles II., we may remark that the bell, which had hitherto been the prize of the successful Horse in racing, was exchanged for the cup, which has continued to be the prize down to the present day.



DENTITION OF HORSE.
(A) upper, (B) lower, jaw.

Mr. Darwin considers that the cause of modification in the forms of Horses greatly arises from their varying conditions of life; that, for instance, Horses living in mountainous regions, or on small islands, become reduced in size from want of a variety of food. Corsica and Sardinia have native breeds of Ponies; and the Puno Ponies living in the lofty regions of the Cordilleras are said to be strange little creatures. But Horses can withstand intense cold, as they live wild on the plains of Siberia, where they scrape away the snow in order to get at the herbage underneath. Not only do the wild Tarpans in the East possess this instinct, but also those that have run wild on the Falkland Islands, as well as the Horses in North America descended from those brought into Mexico by the Spaniards.

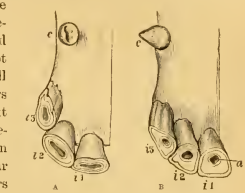
That the original colour of the Horse was dun may be gathered from evidence dating as far back as the time of Alexander the Great, and the wild Horses now in Western Asia and Eastern Europe are of the same colour. In Hungary and Norway, duns with a stripe down the spine are considered of an aboriginal colour.

The series of permanent teeth in the Horse consists of three incisors, one canine, three premolars, and three molars in each jaw, or 40 in all; and is of great interest. The grinders (or molars and premolars) are remarkable for their length, the complexity of their pattern, and for the thick coating of cement which fills up the interspaces of the folds of enamel. The incisors present a peculiar pattern, which is of great importance in deciding the age of a Horse. Each is covered with a layer of enamel, which is folded inwards at the top, after the manner of the finger of a glove, the top of which has been pulled inwards, as is seen in the accompanying figure of a vertical section of an incisor tooth. This hollow is filled with cement, and its state of wear enables the age of the Horse to be ascertained, constituting "the mark."

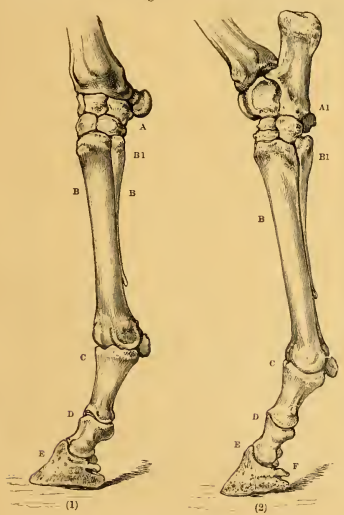
VERTICAL SECTION OF INCISOR OF HORSE.
(*After Owen.*)
e, enamel; *c*, cement; *a a'*, inverted fold of enamel, &c. ("the mark").

A Colt when born has usually the first and second molars forced through the gum, and at seven or eight days old the two central incisor teeth appear; five or six weeks later, the next two incisors. At three months, they are equal to the central ones, and both pairs have nearly reached their natural level. A third grinder has then appeared; and about the eighth month, the third incisor above and below on each side. The Colt has now his full complement of incisor teeth—viz., six in each jaw. At six months the obliteration is apparent in the four central incisors; and at a year and a half the mark will be very faint in the central incisors, and diminished in the other two. A fourth molar appears at twelve months, and a fifth at two years. These are all milk or temporary teeth. At about three years old, the central pair of incisors, or

nippers, both in the upper and lower jaws, are pushed upwards and removed by two permanent teeth, which take their place, and which are distinguishable from the milk teeth by their increased size; a three-year-old Colt, therefore, is easily recognised by the possession of these two new and enlarged incisors. At three years and a half the second incisors will have given place to permanent ones; and at four and a half the remaining incisors will have followed suit. Thus at four years old the central nippers will be fully grown; the next pair will not have attained their full size, and the corner temporary incisors will be worn small, and the mark nearly obliterated. At five years old the mark from the central teeth begins to be effaced, the next pair fully grown, and the corner pair only partially grown. Between the fourth and fifth year the canines begin to appear in the male, two in each jaw; in the female they do not appear until old age. At six years old the mark on the central nippers is much diminished, or obliterated. The other incisors will also be worn, and the canines fully developed. At seven the mark on the next pair of incisors is nearly gone, and the canines rounded at the point and edges. At eight the mark disappears from all the incisor teeth, and the canines are much rounder and blunter. From this time the age of a Horse is difficult to decide, and the teeth of the upper jaw seem to be the best guides. In the accompanying figure (B) the incisors of a Horse aged sixteen years are represented, in which it will be observed that the oval island of enamel, or "mark," has been obliterated, and its place is indicated by a round, dark, island (A), composed of osteo-dentine, which has been formed within the pulp-cavity of the tooth. The absence of the fine white crystalline enamel from the centre of the tooth at once points out the aged Horse from that "in mark," and renders all attempts to produce by artificial means the same pattern impossible, though this trick is by no means unknown or unattempted in horse-dealing.



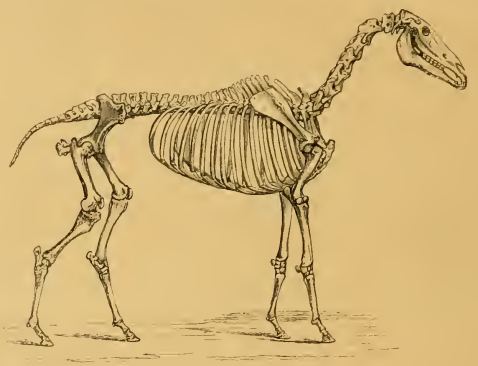
INCISORS AND CANINES OF HORSE (B) AND MARE (A).



BONES OF FORE (1) AND HIND (2) LIMBS OF HORSE.
A, Carpus (knee); A1, Tarsus (hock); B, Cannon bone; B1, Splint bone; C, Greater Posterior; D, Coronet; E, Coffin bone; F, Navicular.

In the whole anatomy of the Horse there is no organ more beautifully adapted for the purposes it serves than the foot, and it is well worthy to be discussed at some length. The foot practically consists of the three last bones of the limb. The bones are firmly bound together by ligaments, affording also attachment to the wonderfully strong tendons by which the foot is moved. A mass of gristle called the lateral cartilage is placed on each side, and behind the bones is an elastic pad which is termed the plantar cushion. A fibrous layer is placed over these, and enveloping the whole is a horny covering known as the hoof. Immediately below the carpus, or the so-called knee of the Horse, in the fore limb, and below the tarsus or hock in the hind limb, we find what are termed the cannon bones. These, which differ little in either fore or hind leg, are really, in point of fact, respectively the metacarpal and metatarsal bones. On each side, towards the hinder part of these cannon bones,

is a bone termed the splint. These splints are in fact rudimentary metacarpal and metatarsal bones. The cannon bones run in a direction vertically downwards, and in the best possible manner for supporting a heavy weight, and in addition the bones are composed of extraordinarily hard and dense material, although to all appearance they are comparatively slender. Altogether, the object looked for is attained—namely, strength with symmetry. The cannon or shank bone proceeds downwards until it reaches a bone known as the greater pastern, and between these two are also two little bones, termed the sesamoids: this portion of the leg is called the fetlock. The sesamoid bones are attached to the back of the cannon bone, and are so arranged as to increase the surface of the joint, and also forming a pulley for the passage of the back tendons. The pastern bone rests immediately upon a bone termed the little pastern or coronet, the former bone being placed obliquely downwards and forwards, being an admirable provision against concussion. It is here, in proportion to the oblique



SKELETON OF HORSE.

position in which this bone is placed, the horseman finds either a springy or jolting action in the Horse he rides. The little pastern or coronet rests upon a bone known as the coffin. (The three bones—viz., the greater pastern, the little and the coffin bone—are really nothing more nor less than three phalanges, the three together being analogous to the human finger or toe.) It is situated partly within and partly without the hoof, and its direction, like the greater pastern, is downwards and forwards, and it is this bone which forms the pivot or centre of motion.

The last bone of the foot, and immediately below the little pastern, as before stated, is the coffin or pedal bone. This bone is strongly imbedded in the hoof, and is convex in front, rounded at the sides, and slightly concave on its under surface. There is around the front and sides of the coffin bone a considerable degree of roughness for the attachment of muscles, which part of the foot is termed the sensitive. The under part is comparatively smooth. Between the coffin and little pastern is a small oblong flattened bone, termed the navicular. It is covered over on its under surface by a smooth cartilaginous layer. This bone probably helps to ward off concussion, also to give a larger surface for membranes containing synovial fluid, or what is known as "joint oil," which preserves the joints from too great friction.

The more striking features in the skull of the Horse are the completion of the orbital ring behind by the union of the frontal and jugal bones, and the edentulous space in front of the molar series, into which the bit is inserted in riding or driving. The brain is large, and that part of it known as the cerebrum, or "big brain" (A), is deeply folded; it does not, however, overlap the cerebellum, or

"little brain" (B), or the olfactory lobes (c). The spinal column is composed of seven cervical, twenty-four dorsal, five sacral, and about seventeen caudal vertebræ.

Of the various diseases the stomach of the Horse is liable to, perhaps the most peculiar is that caused by an insect known as the Gad-fly. With regard to this creature and its mode of attack, Youatt gives the following information:—"In the spring and early part of the summer, Horses are much troubled by a gnat or caterpillar, which causes a great deal of itching and uneasiness. Grooms are sometimes alarmed at the appearance of these insects. Their history is peculiar, and will dispel every fear with regard to them. We are indebted to Mr. Bracy Clark for almost all we know about them. A species of Gad fly (*Œstrus equi*) is, in the latter part of the summer, exceedingly busy about the Horse. It is observed to be darting with great rapidity towards the knees and sides of the animal. The females are depositing their eggs on the hair, which adhere to it by means of a glutinous fluid with which they are surrounded. In a few days the eggs are ready to be hatched, and the slightest application of warmth and moisture will liberate the little animals which they contain. The Horse, in licking himself, touches the egg; it bursts, and a small worm escapes, which adheres to the tongue, and is conveyed with the food into the stomach. There it clings to the cuticular portion of the stomach by means of a hook on either side of its mouth; and its hold is so firm and so obstinate, that it must be broken before it can be detached. It remains there feeding on the mucus of the stomach during the whole of the winter, and until the end of the ensuing spring; when, having attained a considerable size, and being destined to undergo a certain transformation, it disengages itself from the cuticular coat, is carried into the villous portion of the stomach with the food, passes out of it with the chyme, and is evacuated with the excrement. The larva, or maggot, seeks shelter in the ground, and buries itself there; it contracts in size, and becomes a chrysalis or grub, in which state it lies inactive for a few weeks, and then, bursting from its confinement, assumes the form of a fly. The female, becoming impregnated, quickly deposits her eggs on those parts of the Horse which he is most accustomed to lick, and thus the species is perpetuated.

BRAIN OF HORSE.

"There are several plain conclusions to be drawn from this history. The bots cannot, while they inhabit the stomach of the Horse, give the animal any pain, for they have fastened on the cuticular and insensible coat. They cannot stimulate the stomach and increase its digestive power, for they are not on the digestive portion of the stomach. They cannot, by their roughness, assist the trituration or rubbing down of the food, for no such office is performed in that part of the stomach; the food is softened, not rubbed down. They cannot be injurious to the Horse, for he enjoys the most perfect health when the cuticular part of his stomach is filled with them; and their presence is not even suspected until they appear at the anus. They cannot be removed by medicine, because they are not in that part of the stomach to which medicine is usually conveyed: and if they were, their mouths are too deeply buried in the mucus for any medicine, that can safely be administered, to affect them; and last of all, in due course of time they detach themselves, and come away. Therefore the wise man will leave them to themselves."

THE RACE-HORSE.—The breed of Horses for which England is chiefly remarkable is the Race-Horse, resulting from a cross of the English stock with the Arabian; and this was chiefly brought

about by the care of Mr. Darley. The offspring of the Arabian thus introduced was the Devonshire, or Flying Childers, the fleetest Horse of his time, which ran four miles, one furlong, and a hundred and thirty-eight yards in seven minutes and a half. Descended from the same Arabian was Eclipse, who never met an opponent sufficiently fleet to test his powers. He became the sire of three hundred and thirty-four winners; while King Herod, a descendant of the same stock, was the sire of no less than four hundred and ninety-seven winners. The former of these Horses died in 1789, at the age of seventy-five years, after realising for his owner a princely fortune: his skeleton is now preserved in the museum at Oxford. The English Race-Horse, in swiftness and energy, elegance and grace,

ENGLISH RACE-HORSE.

surpasses his Arabian progenitor; and is so superior to other European breeds, that it is usual on the English course to allow foreign Horses an advantage in the weight that they carry. All English Race-Horses are descended either from Arabian or Barb sires.

THE TROTTING HORSE OF AMERICA.—Two nations have the credit of introducing a race of Horses known as the Trotting Horse. One of these is Russia, the other the United States; and the latter has so far excelled her rival, that the Trotting Horse is now generally known as the "Trotting Horse of America." The Russian breed is Arabian on a Flemish stock, and is known as the Orloff Trotter; but from the bending of the knee when the Horse is striding, and the trotting action not being carefully looked after, the animal is considered by good judges to be only "half-developed." The breed of the American Trotter seems to have been both Barb and Arabian on an English stock, the well-known Bashaw Trotters being descended from an imported Barb ancestor, the Grand Bashaw; and Top Gallant was produced by a union of Arab or Eastern breed, with some Horse either English or of English origin. One of the greatest American trainers of the Trotting Horse, Hiram Woodruff, says in his work on this subject that the English had the stock all along, as much as the Americans,

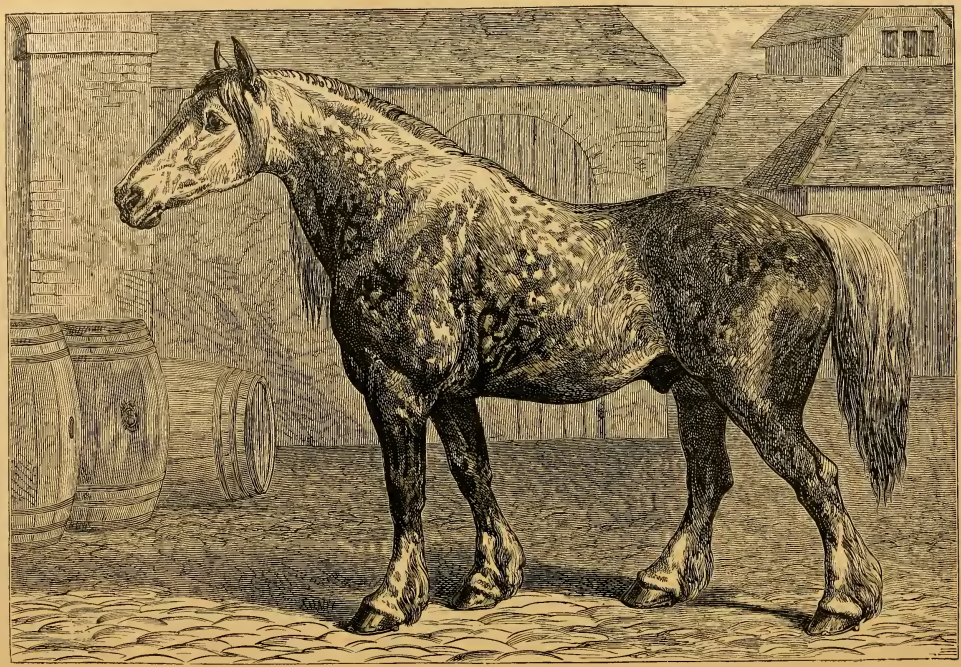
SHETLAND PONIES.

but that the method of training and perseverance of the latter have produced the best and fastest trotters. He entirely disputes the idea of the trot being an artificial action of a Horse, and the common notion that the only two natural paces of that animal are the walk and the gallop; and in vindication of his theory he asks, "Whether a colt can now be found anywhere that does not trot sometimes, and that when he is by the side of his dam, before ever the hand of a man has been laid upon him? If it is said that this results from the long domestication of his ancestors, my reply will be that it happens among the produce of Horses whose ancestors for more than two centuries have never been used for trotting, and were never taught to trot at all, if it is true that the Arabs of the desert only use their Horses at the two so-called natural paces, the walk and the gallop." He further remarks that other animals trot when wild, such as the wild Asses, Zebras, and Quaggas, as well as the Deer and the Elk. He therefore considers that the most careful attention should be given to the training of a young colt for trotting purposes; and that, for a Horse to become a trotter, he should at the early age of two years be broken in with a view to that purpose especially, while his gallop or walk should, so to speak, be kept in the background. His education altogether extends over several years, as both speed and durability have to be considered in his capabilities; sometimes he reaches the age of seven years before his finest powers can be developed. Some of the fastest English trotters go at the rate of a mile in three minutes; while the quickest in America, according to Mr. Woodruff, take only two minutes and twenty-five seconds, or thereabouts, to do the same distance. The Trotting Horse has now become a product of great commercial value to the Americans.

The Dray Horse.—The huge Dray Horse, in its massive form and ponderous strength, and slowness of gait, forms a striking contrast to the Racer and the Trotting Horse. It is as admirably fitted for the slow carriage of heavy weights as the two last are for their elegant swiftness. It is as good an example of the results of judicious selection on the part of man, for a definite purpose, as can be offered by the study of any of the domestic animals.

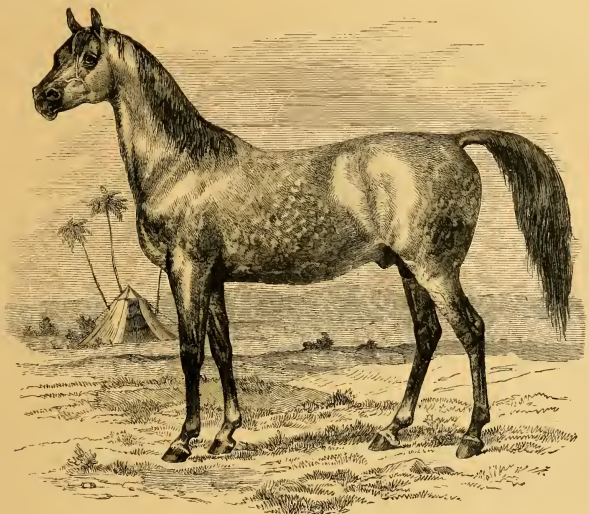
The Shetland Pony.—The smallest variety of Horses in the British Islands is the Shetland Pony, which averages seven or eight hands in height, but yet is wonderfully strong, and capable of enduring an immense amount of fatigue. Its wild, shaggy mane gives it somewhat the appearance, as has been remarked, of a Skye Terrier. It is mischievous and skittish, and generally harder to ride than a full-sized Horse.

The Arab and the Barb.—The two principal varieties of foreign Horses which are important for us to consider are the Arab and the Barb. The Arab would not be acknowledged by every one to be perfect in form. The head, however, is inimitable. "The broadness and squareness of the forehead," writes Youatt, "the smallness of the ears, the prominence and brilliancy of the eye, the shortness and fineness of the muzzle, the width of the nostril, the thinness of the lower jaw, and the beautifully-developed course of the veins, will always characterise the head of the Arabian Horse. The body of the Arab may, perhaps, be considered as too light, and his chest too narrow; but behind the arms the barrel generally swells out, and leaves sufficient room for the play of the lungs. The neck of the Arabian is long and arched, and beautifully joined to the chest. In the formation of the shoulder, next to that of the head, the Arab is superior to any other breed. The withers are high, and the shoulder-blade has its proper inclination backwards. It is also thickly clothed with muscle, but without the slightest appearance of heaviness. The fineness of his legs, and the oblique position of the pasterns, might be supposed by the uninitiated to lessen his apparent strength; but the leg, although small, is deep, and composed of bone of the densest character. The tendons are sufficiently distinct from the bone, and the starting muscles of the fore-arm and the thigh indicate that he is fully capable of accomplishing many of the feats that are recorded of him. It is an error," continues Youatt, "into which almost every writer on the history of the Horse has fallen, that the Arabian is bred in the arid deserts, and owes the power of endurance which he possesses in his adult state to the hardships which he endured while he was a colt. The real fact is, that the Arabs select for their breeding-places some of those delightful spots, known only in countries like these, where, though all may be dry and barren around, there is pasture unrivalled for its succulence, and its nutritious or aromatic properties. The powers of the young animal are afterwards developed, as they alone could be, by the mingled influence of plentiful and healthy food, and sufficient,



ENGLISH DRAY HORSE FROM THE STUD OF MESSRS. BARCLAY, PERKINS & CO.

but not, except in one day of trial, cruel exercise." The attachment an Arab feels for his Horse is proverbial, cases having been recorded of a devotion so deep that the owner prefers almost to starve rather than part with his Horse. The following anecdote is an instance:—"The whole stock of an Arab of the desert consisted of a mare. The French Consul offered to purchase her, in order to send her to his Sovereign, Louis XIV. The Arab would have rejected the proposal, but he was miserably poor; he had scarcely a rag to cover him, and his wife and children were starving. The sum offered was great; it would provide him and his family with food for life. At length, and reluctantly, he yielded. He brought the mare to the dwelling of the consul, dismounted, and stood leaning upon her; he looked



ARAB HORSE.

now at the gold, and then at his favourite. 'To whom is it,' said he, 'I am going to yield thee up? To Europeans, who will tie thee close; who will beat thee; who will render thee miserable. Return with me, my beauty, my jewel, and rejoice the hearts of my children!' As he pronounced the last words, he sprang upon her back, and was presently out of sight."

The Barb is found throughout the North of Africa, from the Mediterranean to the Sahara desert, and has obviously been introduced by the Moors. It is to the Barb that the principal excellence of the Spanish Horse is due; and to this Horse, as well as to the Arab, may be assigned a large share in producing the English Hunter and Racer. All English thoroughbreds are descended from one or other of these.

The Persian Horse is closely allied to the Arab, and possesses great powers of endurance. The distance marked for a race, which Sir R. K. Porter saw, was no less than four-and-twenty miles. In some points, according to Youatt, the Persian Horse excels the Arabian.

Wild Horses in America.—At the time of the discovery of America there were no Horses in

any part of that continent, although the boundless prairies were admirably fitted for the support of countless herds. Soon, however, those imported by the settlers strayed away, and as a consequence horses are now met with in vast numbers, in some cases amounting, it is said, to ten thousand in one troop. They appear to be under the command of a leader, the strongest and boldest of the herd, whom they implicitly obey. When threatened with danger, at some signal, understood by them all, they either close into a dense mass and trample their enemy to death, or, placing the mares and foals in the centre, they form themselves into a circle and welcome him with their heels. The leader first faces the danger, and when prudence requires a retreat all follow his rapid flight. In the thinly inhabited parts of South America, according to Youatt, it is dangerous to fall in with any of these troops. The Wild Horses approach as near as they dare; they call to the loaded Horse with the greatest eagerness, and if the rider is not on the alert, and has not considerable strength of arm and sharpness of spur, his animal will divest himself of his burden, take to his heels, and be gone for ever. Byron well describes the Wild Horse in his "Mazeppa":—

"A trampling troop; I see them come!
In one vast squadron they advance!
I strove to cry—my lips were dumb.
The steeds rush on in plunging pride;
But where are they the reins to guide?
A thousand horse—and none to ride!
With flowing tail, and flying mane,
Wide nostrils—never stretch'd by pain,
Mouths bloodless to the bit or rein,
And feet that iron never shod,
And flanks unscarr'd by spur or rod,
A thousand horse, the wild, the free,
Like waves that follow o'er the sea.
On came the troop . . .
They stop—they start—they snuff the air,
Gallop a moment here and there,
Approach, retire, wheel round and round,
Then plunging back with sudden bound,
They snort—they foam—neigh—swerve aside,
And backward to the forest fly."

Of the meeting a troop of Wild Horses in a more thickly inhabited part of the country, Sir F. Head gives some interesting details. He describes some unfortunate captured animals as being forced along by their riders at their very utmost speed: "As they are thus galloping along, urged by the spur, it is interesting to see the groups of Wild Horses one passes. The mares, which are never ridden in South America, seem not to understand what makes the poor Horse carry his head so low and look so weary. The little innocent colts come running to meet him, and then start away frightened; while the old Horses, whose white marks on the flanks and backs betray their acquaintance with the spur and saddle, walk slowly away for some distance, then breaking into a trot as they seek their safety, snort and look behind them, first with one eye and then with the other, turning their noses from right to left, and carrying their long tails high in the air."

The capture and breaking in of Wild Horses in America are described by Miers as follows:—

"The lasso is a missile weapon, used by every native of the United Provinces and Chili. It is a very strong plaited thong of equal thickness, half an inch in diameter, and forty feet long, made of many strips of green hide, plaited like a whip-thong, and rendered supple by grease. It has at one end an iron ring, above an inch and a half in diameter, through which the thong is passed, and this forms a running noose. The Gaucho, or native peon, is generally mounted on horseback when he uses the lasso. One end of the thong is affixed to his saddle-girth; the remainder he coils carefully in his left hand, leaving about twelve feet belonging to the noose end in a coil, and a half of which he holds in his right hand. He then swings this long noose horizontally round his head, the weight of the iron ring at the end of the noose assisting in giving to it, by a continued circular motion, a sufficient force to project it the whole length of the line." The Gauchos drive the Wild Horses into a corral, which is a circular space surrounded by rough posts firmly driven into the ground. The corral, relates Miers,

"was quite full of Horses, most of which were young ones about two or three years old. The *Capitaz* (chief Gaucho), mounted on a strong, steady Horse, rode into the corral, and threw his lasso over the neck of a young Horse and dragged him to the gate. For some time he was very unwilling to lose his comrades; but the moment he was forced out of the corral his first idea was to gallop away; however, a timely jerk of the lasso checked him in the most effectual way. The peons now ran after him on foot and threw a lasso over his fore legs, just above the fetlock, and twitching it, they pulled his legs from under him so suddenly that I really thought the fall he got had killed him. In an instant a Gaucho was seated on his head, and with his long knife, in a few seconds, cut off the whole of the Horse's mane, while another cut the hair from the end of his tail: this, they told me, was a mark that the Horse had been once mounted. They then put a piece of hide in his mouth to serve for a bit, and a strong hide halter on his head. The Gaucho who was to mount arranged his spurs, which were unusually long and sharp, and while two men held the Horse by his ears, he put on the saddle, which he girthed extremely tight. He then caught hold of the Horse's ear, and in an instant vaulted into the saddle; upon which the man who held the Horse by the halter threw the end to the rider, and from that moment no one seemed to take any further notice of him. The Horse instantly began to jump in a manner which made it very difficult for the rider to keep his seat, and quite different from the kick or plunge of an English Horse; however, the Gaucho's spurs soon set him going, and off he galloped, doing everything in his power to throw his rider. Another Horse was immediately brought from the corral; and so quick was the operation that twelve Gauchos were mounted in a space which, I think, hardly exceeded an hour. It was wonderful to see the different manner in which different Horses behaved. Some would actually scream while the Gauchos were girding the saddle upon their backs; some would instantly lie down and roll upon it; while some would stand without being held, their legs stiff and in unnatural positions, their necks half bent towards their tails, and looking vicious and obstinate; and I could not help thinking that I would not have mounted one of those for any reward that could be offered me, for they were invariably the most difficult to subdue. It was now curious to look around and see the Gauchos on the horizon in different directions, trying to bring their Horses back to the corral, which is the most difficult part of their work, for the poor creatures had been so scared there that they were unwilling to return to the place. It was amusing to see the antics of the Horses; they were jumping and dancing in different ways, while the right arm of the Gauchos was seen flogging them. At last they brought the Horses back, apparently subdued and broken in. The saddles and bridles were taken off, and the young Horses trotted off towards the corral, neighing to one another. When the Gaucho wishes to take a Wild Horse, he mounts one that has been used to the sport and gallops over the plain. As soon as he comes near his victim, the lasso is thrown round the two hind legs, and as the Gaucho rides a little on one side, the jerk pulls the entangled Horse's feet laterally, so as to throw him on his side without endangering his knees or his face. Before the Horse can recover the shock, the rider dismounts, and snatching his *poncho*, or cloak, from his shoulders, wraps it round the prostrate animal's head. He then forces into his mouth one of the powerful bridles of the country, straps a saddle on his back, and bestriding him, removes the poncho; upon which the astonished Horse springs on his legs, and endeavours by a thousand vain efforts to disencumber himself of his new master, who sits quite composedly on his back, and, by a discipline which never fails, reduces the Horse to such complete obedience that he is soon trained to lend his whole speed and strength to the capture of his companions."

WILD HORSES IN AUSTRALIA.—In Australia, as well as in America, the Horses imported by the colonists have escaped into the wilds, and reverted to their feral condition. They are known as "Brumbies," and are a serious inconvenience to the stock farmer, because they entice away his Horses and spoil his carefully selected breeds. The animal develops wonderful sagacity in avoiding the sportsman, and his keenness of scent and vigilance are certainly as great as in any other animal which seeks in flight safety from man. These Brumbies were described by Anthony Trollope, himself an ardent Fox-hunter, as being perfect marvels of ugliness. These animals are found in enormous numbers in some districts. In 1875, for example, no less than seven thousand are stated to have been shot in one station in New South Wales, still leaving plenty behind to perpetuate the race.

THE ASS.—Four species of Asses and three of Zebras are described by naturalists, but our domestic animal is probably descended from one alone; the *Asinus teniopus* of Abyssinia. In Great

Britain, and generally in Central Europe, the Ass has not given rise to distinct breeds like those of the Horse, a fact which may be accounted for, as Mr. Darwin remarks, by the animal being kept by poor persons who do not carefully match and select the young. Its small size in England and Northern Europe is probably due far more to want of care in breeding than to cold, for in Western India it is not much larger than a Newfoundland Dog, being usually not more than from twenty to thirty inches high.

The Ass varies greatly in colour, and its legs, especially the fore legs, are sometimes transversely

DOMESTIC ASS.

barred; a fact which may be explained on the hypothesis of the reappearance of the attributes of the parental form. "The stripes," Mr. Darwin says, "are believed to occur most frequently and to be plainest on the legs of the Domestic Ass during early youth, as is apparently likewise the case with the Horse. The shoulder-stripe, which is so eminently characteristic of the species, is nevertheless variable in breadth, length, and manner of termination. I have measured a shoulder-stripe four times as broad as another, and some more than twice as long as others. In one light-grey Ass the shoulder-stripe was only six inches in length and as thin as a piece of string; and in another animal of the same colour there was only a dusky shade representing a stripe. I have heard of three white Asses—not albinoes—with no trace of shoulder or spinal stripes, and I have seen nine other Asses with no shoulder-stripe, and some of them had no spinal-stripe. Three of the nine were light greys, one a dark grey, another grey passing into reddish roan, and the others were brown, two being tinted on

parts of their bodies with a reddish or bay shade. Hence we may conclude that if grey and reddish-brown Asses had been steadily selected and bred from, the shoulder-stripe would have been almost as generally and as completely lost as in the case of the Horse.

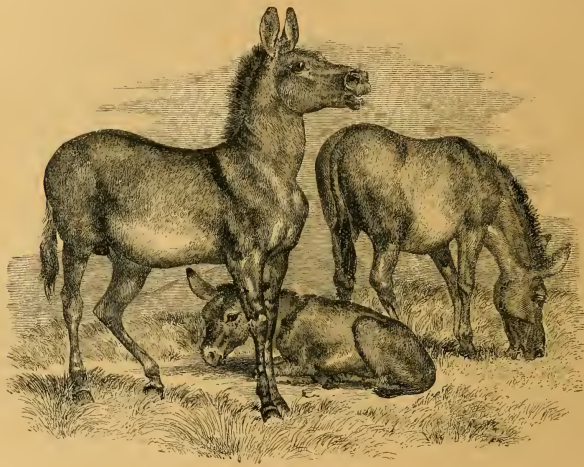
"The shoulder-stripe on the Ass is sometimes double, and Mr. Blyth has seen even three or four parallel stripes. I have observed in ten cases shoulder-stripes abruptly truncated at the lower end, with the anterior angle produced into a tapering point, precisely as has been figured in the Dun Devonshire Pony. I have seen three cases of a terminal portion abruptly and angularly bent, and two cases of a distinct, though slight, forking. In Syria, Dr. Hooker and his party observed for me

ONAGER.

no less than five instances of the shoulder-stripe being plainly forked over the fore leg. In the common Mule it is likewise sometimes forked. When Spist noticed the forking and angular bending of the shoulder-stripe, I had seen enough of the stripes in the various equine species to feel convinced that even a character so unimportant as this had a distinct meaning, and was thus led to attend to the subject. I now find that in the *Asinus Burchellii* and *Quagga*, the stripe which corresponds with the shoulder-stripe of the Ass, as well as some of the stripes on the neck, bifurcate, and that some of those near the shoulder have their extremities angularly bent backwards. The forking and angular bending of the stripes on the shoulders apparently stand in relation with the changed direction of the nearly upright stripes on the sides of the body and neck to the transverse bars on the legs. Finally, we see that the presence of shoulder- leg- and spinal-stripes in the Horse, their occasional absence in the Ass, the occurrence of double and triple shoulder-stripes in both animals, and the similar manner in which these stripes terminate at their lower extremities, are all cases of analogous variation in the Horse and Ass. These cases are probably not due to similar conditions acting on similar constitutions,

but to a partial reversion in colour to the common progenitor of these two species, as well as of the other species of the genus."

The Asses, beside the characters above mentioned, have the upper part of the tail covered with short hairs, while the lower part terminates in a long hairy tuft; horny excrescences, or warts, exist on the fore legs alone. In England, as we have before remarked, Asses are small and without much variation, because their points have not been selected. When, however, care is taken in breeding, the result is as remarkable as in the case of the Horse. Near Cordova, according to Mr. Darwin, they are carefully bred, as much as two hundred pounds having been paid for a stallion Ass. Asses from Spain, Malta, and France have been introduced into Kentucky for the breeding of Mules, which have been raised by the care of the Kentuckians from their original size of fourteen hands to sixteen hands



WILD ASS OF ABYSSINIA.

in height. Great prices are put on these splendid animals, one of great celebrity having been sold for over one thousand pounds. At their cattle shows, one day is given up to the exhibition of Asses.

Asses have always been in repute in the East, and much pains have been taken in their breeding. They are frequently mentioned in the Bible, from which it appears that white Asses were used by people of high rank, as may be seen from the following verse (Judges v. 10): "Speak, ye that ride on white Asses, ye that sit in judgment, and walk by the way."

The Mule and Hinny.—The hybrid offspring of the Ass and the Mare is the Mule; while the Hinny is that of the Horse and female Ass. Of these the Mule is by far the larger, taking more the form and appearance, as well as the dimensions, of the mare; while the latter assumes so much of the nature and general appearance of the Ass as to render the breeding of it undeserving of attention.

The Wild Ass of Tibet.—We are indebted to Dr. Sclater, the accomplished Secretary of the Zoological Society of London, for an interesting account of the various species of Wild Asses. The Kiang, or Wild Ass of Tibet, inhabits the high plateaux, at no less an altitude than from fifteen to sixteen thousand feet above the sea. It is a large animal, measuring fourteen hands in

ZEBRA.

(*From the Living Specimen in the Zoological Gardens, London.*)

height, and is exceedingly swift and wary. The back is marked by a broad black line, but there is no transverse bar across the shoulders; it is probably the true *Equus hemionus* of Pallas. (See figure, p. 295.)

The Onager, or Wild Ass of the Asiatic deserts, presents several varieties. That variety which inhabits Cutch and Scinde is remarkable for its swiftness and difficulty of approach. It is closely allied to the Wild Ass of Assyria, named by St. Hilaire *Equus hemippus*. (See figure, p. 311.)

BURCHELL'S ZEBRA.

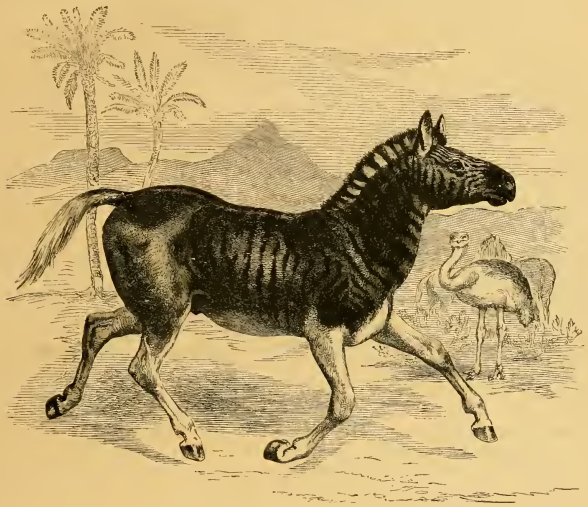
The Wild Ass of Abyssinia, the parent form from which the domestic animals were derived, is readily distinguishable from the above species by the stripes on its hind legs. (See figure, p. 312.)

The Zebras.—Dr. Sclater describes three species of Zebra: the black and white, or true Zebra, which inhabits the mountains; Burchell's Zebra, or the black and yellow Zebra, which inhabits the plains; and the Quagga. The true Zebra inhabits the hilly districts of Southern Africa, and is remarkable for its beauty and its fierce and untamable nature. It is by far the most conspicuous and most beautiful of the Ass tribe. The stripes which define it from the ordinary Asses are remarkably like those of the Tiger in their arrangement. Those on its legs are horizontal, while those of its body are for the most part vertical.

Burchell's Zebra is found in great numbers north of the Orange River; and, according to Sir Cornwallis Harris, "seldom congregating in herds of fewer than eighty or a hundred, it abounds to a great extent in all the districts included between that noble stream and the southern tropic. Occupying the same regions and delighting in the same pastures as the Brindled Gnu, rarely is it to

be seen unless in the companionship of that fantastic animal, whose presence would seem to be almost indispensable to its happiness. It is singular enough that the members of two families so perfectly foreign to each other should display so great a predilection for each other's society, uniformly intermixing as they do, and herding in bonds of the closest friendship. Fierce, strong, fleet, and surpassingly beautiful, there is, perhaps, no quadruped in the creation, not even excepting the Mountain Zebra, more splendidly attired, or presenting a picture of more singularly attractive beauty, than this free-born child of the desert."

The QUAGGA, which is less attractively coloured, and inhabits a different tract of country, is



QUAGGA.

also described by Sir Cornwallis Harris, as follows:—"The geographical range of the Quagga does not appear to extend to the northward of the river Vaal. The animal was formerly extremely common within the colony; but, vanishing before the strides of civilisation, is now to be found in very limited numbers, and on the borders only. Beyond, on those sultry plains which are completely taken possession of by wild beasts, and may with strict propriety be termed the domains of savage nature, it occurs in interminable herds; and, although never intermixing with its more elegant congeners, it is almost invariably to be found ranging with the White-tailed Gnu and with the Ostrich, for the society of which bird especially it evinces the most singular predilection. Moving slowly across the profile of the ocean-like horizon, uttering a shrill, barking neigh, of which its name forms a correct imitation, long files of Quaggas continually remind the early traveller of a rival caravan on its march. . . Bands of many hundreds are thus frequently seen during their migration from the dreary and desolate plains of some portion of the interior, which has formed their secluded abode, seeking for those more luxuriant pastures where, during the summer months, various herbs thrust forth their leaves and flowers to form a green carpet, spangled with hues the most brilliant and diversified."

THE FOSSIL EQUIDÆ.

The living members of the family of Horses are, as we have seen, restricted to the region of the Old World, and were unknown in the Americas and in Australia, when those countries were first discovered. From an examination, however, of their fossil remains, it is evident that in the Pliocene and Pleistocene times Horses were widely distributed in both North and South America. The bones and teeth in caves and river deposits of Europe also show that Wild Horses were very numerous in Europe in the latter age. We are even able to form an accurate idea of the European Wild Horse from the engravings which the ancient hunters of Reindeer have left behind in caves of Auvergne, Switzerland, and Derbyshire. The outline engraved on a bit of bone or a fragment of antler shows us an animal with a large head, thick neck, and big mane, coarse and clumsy in its points, as might be expected from an aboriginal wild breed not subject to the care and selection of man. The Horse, like the Bison and the Reindeer, formed a large part of the food of these ancient men of the caves, and was not domesticated. The true Horses begin to appear in Europe in the later Pliocene strata.

In the early Pliocene and late Miocene ages the family of Horses is represented by the HIPPARION, a small, slender, graceful animal, possessed of three well-defined toes, bearing hoofs, on each limb: one strong and large in the middle, while the two lateral toes are so small that they do not extend beyond the fetlock. They may be compared to dew-claws. The teeth are like those of the Horse, but shorter, and the pattern of the enamel on the grinding surface is more complicated. In the early Miocene and late Eocene the ANCHITHERIUM appears. Its orbit is not so completely encircled with bone as in the Horses and Hipparion.

"The shaft of the ulna," writes Professor Huxley, "is stouter than in Hipparion, and is less closely united with the radius. The fibula appears—at any rate, in some cases—to have been a complete though slender bone, the distal end of which is still closely united with the tibia, though much more distinct than in the Hipparions and Horses. In some specimens, however, the middle of the shaft seems to have been incompletely ossified. Not only are there three toes in each foot, as in Hipparion, but the inner and the outer toes are so large that they must have rested upon the ground. Thus, so far as the limbs are concerned, the Anchitherium is just such a step beyond the Hipparion as the Hipparion is beyond the Horse, in the direction of a less specialised quadruped. The teeth are still more divergent from the Equine type. The incisors are smaller in proportion, and their crowns lack the peculiar pit which characterises those of Equus and Hipparion. The first grinder is proportionally much larger, especially in the upper jaw, and, like the other six, has a short crown and no thick coat of cement. The pattern of their crowns is wonderfully simplified. The fore and hind ridges run with but a short obliquity across the crown, and the pillars are little more than enlargements of the ridges, while in the lower jaw these pillars have almost entirely disappeared. But the foremost of the six principal grinders is still somewhat larger than the rest, and the posterior lobe of the last lower molar is small, as in the other Equidæ."

In all those respects in which Anchitherium departs from the modern Equine type it approaches that of the extinct *Palæotheria;* and this is so much the case that Cuvier considered the remains of the Anchitherium, with which he was acquainted, to be those of a species of Palæotherium. From these considerations it may be concluded that the highly specialised Horse has obtained its characteristics by descent from the Hipparion, and that again from the Anchitherium. In some cases on record there is a reversion towards the ancestral type, Horses having been born with tridactyle feet, similar in every respect to those of the Hipparion.

The lineage of the Horse is traceable yet further back by the discoveries of Marsh and Cope in New Mexico, Wyoming, and Utah, in North America, up to the Eohippus of the Lower Eocene, a small animal not larger than a Fox, and with three toes on the hind foot and four and a rudiment of a fifth on the fore foot. It must further be noted that the fossil Horses increased in size as they lost their toes, and that the living Horse is the biggest of the family.

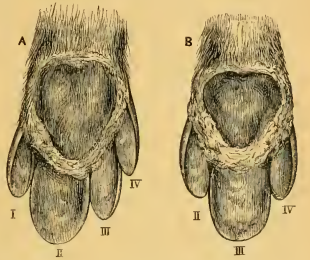
CHAPTER II.

PERISSODACTYLA—THE TAPIR AND RHINOCEROS FAMILIES.

Introductory Remarks on the Tapirs—Foot—Anatomical Features—Skull—Compared with that of Hog—Skull of Asiatic Tapir—Proboscis—Dentition—Species of Tapir—The American Tapir—Habits—Colour—Modes of Hunting—Docility—The Hairy Tapir—The Malayan Tapir—Fossil Tapirs—The Rhinoceroses—General Characteristics—Is it the Reëm of the Bible?—Ludicrous Ideas respecting it—At Rome—First Rhinoceroses in Europe—Skeleton—Skull—Horns—Curious Dental Law—Fore and Hind Limbs—Dentition—African Rhinoceroses—"White" Rhinoceros—Oswell's Rhinoceros—Black Rhinoceros—Keitloa—Rhinoceros Bicornis Minor—Hunting—Sir Samuel Baker's Extraordinary Chase—Gordon Cumming's Account of the Characteristics and Habits of the Black and White South African Rhinoceroses—Rhinoceros Birds—The Asiatic Rhinoceroses—Connection between Dentition and Horns—The Indian Rhinoceros—An Inveterate Enemy of the Elephant—The Javan Rhinoceros—The Sumatran Rhinoceros—The Hairy-Eared Rhinoceros—How a Specimen, "Begum," was Captured—The Fossil Rhinoceroses—The Extinct Families Palæotheridæ and Macraucheniadæ.

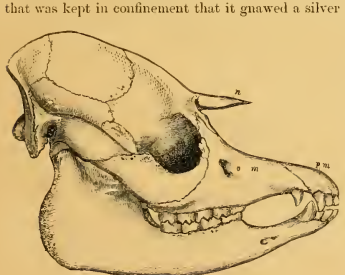
II.—THE TAPIRIDÆ (FAMILY OF TAPIRS).

The Hog-like creatures which constitute the family of Tapirs form the second division of the quadrupeds which are possessed of three toes on their hind feet, and are therefore termed, as has already been said, the Perissodactyla. It must not, however, be forgotten that these creatures possess a fourth toe on the fore foot, which is small and does not reach to the ground. The family is represented by one genus only—*Tapirus*—which is distributed over wide regions in the warmer parts of the Old and the New Worlds. All the animals comprised under it possess short and movable trunks, by which they convey their food into their mouths, and at the extremity of which are placed the nostrils. They are of a brownish-black colour; the skin is hairy and extremely thick, and the tail is very short.



Fore (A) and hind (B) foot of Tapir. (*After Murie.*)

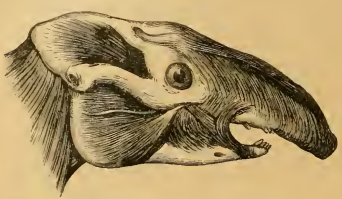
The Tapir inhabits principally the inmost recesses of dense forests, is nocturnal in its habits, and is phytophagous, that is, feeds on vegetables. However, it is said that it is also an indiscriminate swallower of everything, filthy or clean, nutritious or otherwise, pieces of wood, clay, pebbles, and bones being not uncommonly found in its stomach; and it is even stated of one that was kept in confinement that it gnawed a silver snuff-box to pieces and swallowed the contents.



Skull of American Tapir.
n, Nasal Bone; *m*, Maxillary Bone; *pm*, Pre-maxillary Bone.

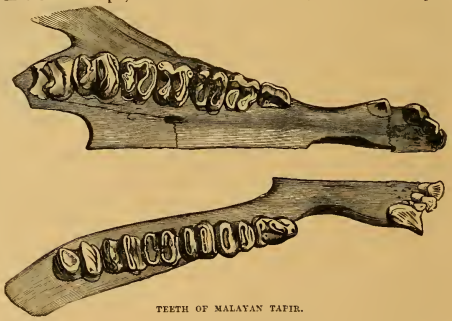
The skull of the Tapir, seen in profile, reminds us strongly of that of the Hog, the same pyramidal elevation being brought to view. Examined closely, however, we find that this pyramid differs immediately from that of the latter animal by the possession of only three faces, while in the Pig there are four. In addition, it is also to be noticed that the anterior line is formed by the joining of the lateral faces, dilating into a triangle only towards the front: this being due to the frontal bones, which are early united and directed somewhat backwards. The bones of the nose are articulated to the base of the triangle, and here there is a point which penetrates between them. A deep furrow, produced by the upper border of the orbit, descends from the two sides above the orbit, which, approaching the sub-orbital hole, serves for the insertion of various muscles connected with the proboscis. With regard to the differences between the skull of the Malayan Tapir and the

American, Cuvier observes that a glance at the profile of their respective crania is sufficient to impress upon the observer their specific differences. The forehead of the Indian Tapir is convex, and rises higher than the back of the head. It is accompanied, in its rise, by the nasal bones, an arrangement by which space is given for the comparatively large proboscis, and adding length to the furrows where the muscles are inserted. This organisation, according to Cuvier, explains why the Indian Tapir has a more powerful and more extensile trunk than the American. There is also in the former, on the base of the nasal bones, at their junction with the frontal bones and on each side, a deep fossa, or depression, which does not exist in the other species. This elevation of the forehead is accompanied by a depression of the occipital crest, which, far from forming a pyramid, as in the American species, rather descends backwards. The aperture of the bony nostrils, enlarged by the prolongation of the maxillary bones, terminates below and forwards by more elevated premaxillaries, which are fused (anchylosed) together in early youth, as in the American.



HEAD OF MALAYAN TAPIR, SHOWING MUSCLES OF SHORT TRUNK AND FACE. (*After Marie.*)

In the upper jaw there are, in the adult Tapir, on each side three incisors, one canine, four premolars, and three molars. In the lower jaw, on each side, there are three incisors, one canine, three premolars, and three molars: altogether making forty-two teeth in number.



TEETH OF MALAYAN TAPIR.

Some peculiarities offer themselves with regard to the form of the teeth: for instance, the outer incisors above are very large and resemble canines, while those below are unusually small. The canines themselves are very small, having their crowns considerably shorter than their roots.

With regard to other portions of the skeleton nothing need be remarked, except that the bones of the extremities are exceedingly strong, and resemble in many respects those of the Rhinoceros.

Three species of Tapirs are known, namely, American Tapir (*Tapirus americanus*), Roulin's Tapir (*Tapirus villosus*), and Asiatic Tapir (*Tapirus malayanus*).

THE AMERICAN TAPIR.*—Of the three foregoing species the best known is the American Tapir, which is found in almost all parts of South America from Buenos Ayres to Central America, and from the Andes to the Atlantic. In its habits it is nocturnal, spending the whole of the day-time in the cool shades of the densest forests, and coming forth to feed on the surrounding vegetation as evening approaches. It is a most powerful animal, and everything in the underwood of the forest gives way to its rush. It has the habit of making runs or roads through the brushwood, which beaten tracks are usually selected by travellers in passing through the forests. It is stated that it has a most keen

* *Tapirus americanus.*

sense of smell, enabling it to detect its enemies at long distances, when it at once rushes into brush-wood or thicket so dense that neither man nor horse can follow. It never attacks man without being very hardly pressed and brought to bay.

AMERICAN TAPIRS.

It is excessively fond of the water, being a most expert swimmer, and usually keeping to a particular track in the element in which it indulges.

The American species is characterised by having the general colour throughout of a deep brown, approaching to black; but the sides of the lower lip, band on the under and middle part of the chin,

upper edges of the ears, and naked line at the bottom of the hoofs, are snowy white. The scanty hair of the body is very short, and is hardly to be distinguished at a comparatively short distance.

The skin, which is of great density beneath, is described by M. Roulin to be not less than seven lines thick on the back; and he says that in the days when rifles were not brought to their present pitch of perfection a ball from one of them would scarcely make an impression.

On the back of the neck there is a thick rounded crest, which extends from the forehead, as low as the level of the eyes, to the shoulders, and beset with a comparatively thin mane of stiff blackish bristles.

The American Tapir is hunted for its excessively tough hide, and also for its flesh, which, although described by Europeans as unsavoury, being coarse and dry, is considered palatable by the Indians. It is captured sometimes, although not often, by means of the lasso, an instrument so successful in Horse-catching in America, but often futile as regards the Tapir, for its usual haunts render this mode of capture most difficult, and its determined rush and immense strength frequently enable it to break the strongest lasso. Another way of hunting the Tapir practised by the native hunters is to find out the animal's track leading to the water; there, with their Dogs, they patiently lie in wait until evening approaches, when the Tapir comes out for the purpose of taking his evening stroll and indulging in the indispensable bath. They then get between him and the water, when a desperate encounter ensues, the Dogs often getting very badly injured.

The most successful manner of catching the Tapir, however, is by means of imitating its whistle or call, thus bringing the animal within range of the Indian's poisoned arrow.

The American Tapir is spoken of as being mild in captivity and easily domesticated, and tame Tapirs are permitted to run at large in the streets of the towns of Guiana, and often wander

MALAYAN TAPIR.

into the forests, but return again in the evening to the house in which they are kept and fed. The Tapir is capable of considerable attachment to its owner, and possibly, by care and attention, might be turned to good account, as the qualities with which it is credited—strength, docility, and patience—ought to render it capable of the duties of a beast of burden.

THE HAIRY TAPIR,* the second species of American Tapir, inhabits the inner range of the Cordilleras, this species being strictly mountainous in its habits.

It is stated to differ from the other species of America by not possessing a mane; but has altogether longer hair, and there are no wrinkles on the proboscis. In the conformation of the skull and general characteristics it more nearly resembles the Asiatic Tapir than the American, and is less common than the latter animal.

THE MALAYAN TAPIR.†—The Asiatic Tapir, which appears to have become known to Europeans only in the present century—at least, the first certain information of it reached Europe in the year 1816—is an inhabitant of Sumatra, Malacca, and the south-west provinces of China. It is said to have been found also in Borneo. In size it is larger than either *T. americanus* or *T. villosus*. It is distinguished by the absence of a mane, the general colour of the hair being glossy black, but with the back, rump, and sides of the belly white.

In its habits the Asiatic Tapir appears to be similar to his American cousin, and in captivity it is said to be of a most mild and inoffensive disposition, becoming as tractable and familiar as a Dog.

FOSSIL TAPIRS.—The living Tapir is known at the present day only in the warmer regions of the New and Old Worlds, in South America, and in the East. In the Pleistocene Age, however, it is proved to have ranged far up the valley of the Mississippi in the United States. In the Miocene and Pliocene Ages the animal inhabited Europe, and its fossil teeth are met with by no means unfrequently in the Crag deposits of Norfolk and Suffolk. The *Lophiodon* of the European and American Eocenes is also a closely allied form.

III.—THE RHINOCEROS FAMILY (RHINOCEROTIDÆ).

The Rhinoceroses form the third family of the sub-order of Perissodactyla. They are to be found in Africa south of the Sahara Desert, and in Eastern Asia—in India, Java, and Sumatra, &c., where the climate is tropical or sub-tropical. They are represented by several living species, as well as by several extinct forms which ranged, in the later Tertiary times, over nearly the whole of Europe and Northern Asia. The principal characters which are to be observed in the Rhinoceros are the large unwieldy bodies, supported on short, stout legs, terminating in a large callous pad with hoof-bearing toes, the large and long head, the small eyes and ears, and the short tail. All the living species also possess one or two horns, which are placed in the middle line of the head on and above the nose. The horns are to be viewed as a mere appendage to the skin, like hair, for they are only skin deep, and are composed of a series of fibres matted together, and are essentially a mass of hair in which each hair is confluent with those next to it. Horns were present also in all the fossil species excepting one, the Aceratherium, the hornless Rhinoceros of the Miocene Age. The skin in all the Rhinoceroses is very thick, and is converted into a jointed armour in some of the Asiatic species; it is also scantily covered with hair, except in "the Hairy-eared Rhinoceros." A fossil kind was woolly.

It is a disputed point whether the word Reèm, mentioned several times in the Bible, and translated in the authorised version as Unicorn, is the Rhinoceros or the Urus; the probability seems to be that the latter is intended. The first time Reèm is mentioned in the Bible is in Numbers xxiii. verses 21, 22, to the following effect:—"The Lord his God is with him, and the shout of a king is among them. God brought them out of Egypt; he hath as it were the strength of Reèm." Whatever animal Reèm may have been, it was a creature evidently of great power, and the strongest known to the prophet. In another passage—Deut. xxxiii. verses 16, 17—we obtain the information that Reèm was a two-horned and not a one-horned animal, and therefore could not possibly have been the Indian Rhinoceros at least, and that it is mentioned at the same time with Bullocks. Other passages speak

* *Tapirus villosus.* † *Tapirus malayanus.*

of Reèm in connection with the plough and harrow, for which its tameless and savage disposition rendered it unfit. It is also spoken of in Isaiah in connection with sacrifices of cattle (chap. xxxiv. verses 6, 7).

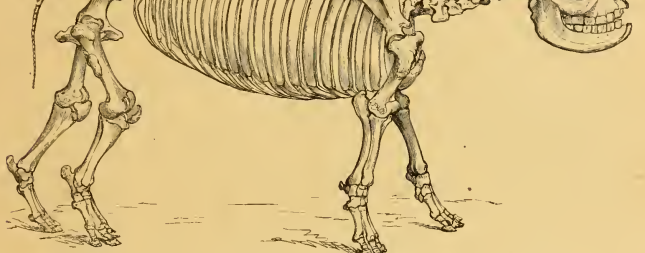
Topsel, an author of the sixteenth century, while trying to show that there lived such a creature as the fabled Unicorn, and giving a picture representing it as possessing the horn of the Narwhal, the body of a Horse, and the feet of an Ox, successfully shows Reèm to mean neither a Unicorn nor Rhinoceros, but simply an Ox. He relates :—"That there is such a beast the Scripture itself witnesseth, for David thus speaketh in the 92nd Psalm : *Et erigetur cornu meum tanquam monocerotis* —that is, my horne shall bee lifteth up as the horne of a unicorn." He goes on to say : "We have already shown, in the story of the Rhinoceros, that Reèm in Hebrew signifies a Unicorne, although Munster be of another opinion ; yet the Septuagints, in the translation of Deut. xxxiii., do translate it a Unicorne, for the Rhinoceros hath not one horne but two. Rabbi Solomon, David Kimchi, and Saadius do always take Reèm and Karas for a Unicorne, and they derive Reèm from Rom, which signifieth *Altitudinem*, height, because the horne of the Unicorn is lifted up upon high. Hereunto the Arabians agree, which call it *Barkeron*, and the Persians *Bark ;* the Chaldeans, *Remana*. In the 39th chapter of Job the Lord speaketh in this manner to Job :—'Will the Unicorne rest and serve thee, or tarry beside thy cratches ? Canst thou bind the Unicorne with a halter to thy plough to make furrows ? or will he make plaine the clots of the valleys ?' . . . Whereby God Himself must needs be traduced if there be no Unicorne in the world." We may therefore conclude that Reèm was one of the Oxen wild in those times in Palestine. It, probably, was the great wild Ox, or Urus, which formerly abounded in the forests of Macedonia, and was hunted in the forests of Germany as late as the tenth century after Christ.

The Rhinoceros was first seen at Rome, according to Pliny, in the games given by Pompey to the Roman people. He describes it as being possessed of one horn on its nose, which it sharpens on a stone before it fights, and that when it fights with the Elephant it attempts to rip its belly open. The earliest time the animal was mentioned by name was by Agatharchides, who describes it as fighting in the manner above alluded to. In both these instances it is evident that the one-horned Asiatic species is meant. The African Rhinoceros, according to Dion Cassius, was for the first time brought before the notice of the Romans in B.C. 39, in the games given by Augustus to celebrate his victory over Cleopatra. It was exhibited along with a Hippopotamus, and both animals were in all likelihood obtained from the Upper Nile.

Probably the first Rhinoceros ever seen by modern Europeans was a one-horned species, the *R. unicornis*, sent from India to Emanuel, King of Portugal, in 1513. A sketch was sent from Lisbon to Nürnberg, and a most extraordinary engraving was made by Albert Dürer, from which Gesner, Topsel, &c., took copies. This animal was made to appear in a wonderful suit of armour beautifully decorated, and supplied with a second horn on the shoulders, resembling the point of that of the Narwhal. Topsel's description of the Rhinoceros is most ludicrous—"First of all, that there is such a beast in the world both Pliny, Solinus, Diodorus, Ælianus, Lampridius, and others, doe yeald ere-frigable testimony." He then goes on to say : "The picture here expressed was taken by Gesner from the beast alive at Lisbon, in Portugale. . . . Eucherius saith that the Rhinoceros hath two hornes in his nose, but that is utterly false, as you may see by the picture. . . . The Rhinoceros cast up a Beare into the aire even as a Bull would do a ball which were laid upon his two hornes ; we shall not neede to apply *Gemino cornu* to the Bull, as Politianus doth, but rather take it figuratively for a strong horne, and if it must needs be litterall, it is apparent by the picture that there is another little horne, not upon the nose, but upon the wither of the beast. . . . When they are to fight they whet their horne upon a stone ; and there is not only a discord betwixt these beasts and Elephants for their food, but a naturall description and enmity : for it is confidently affirmed that when the Rhinoceros which was at Lisbone was brought into the presence of an Elephant, the Elephant ran away from him. . . Hee (the Rhinoceros) is taken by the same means that the Unicorn is taken, for it is said by Albertus, Isidorus, and Alumnus, that above all other creatures they love virgins, and that unto them they will come, be they never so wilde, and fall asleep before them, so being asleep they are easily taken and carried away." Topsel then goes on to inform us that "all the later physicians attribute the virtue of the Unicorn's horne to the Rhinoceros's

horn, but they are deceived by imitation of Isidorus and Albertus, for there is none of the ancient Græcians that have ever observed any medicines in the Rhinoceros. The Indians made bottles of their skins, wherein they put their lycion, or *succum medicatum*."

The first Rhinoceros brought alive to England was in 1685, and another was shown throughout a great part of Europe in 1739, and another in 1741. Parsons* described and figured the Rhinoceros of 1739, and refers to that of 1741, which Cuvier says he believes to be the same animal afterwards shown in Paris in 1749, painted by Oudry, and afterwards engraved by Edwards and figured by Albinus. It was the one described by Daubenton, as well as by Meckel. The one of which Cuvier gives the osteology was the fifth brought to Europe. It arrived at Versailles in 1771, and died in 1793, at the age of about twenty-six years. Another Rhinoceros arrived from the East Indies in 1790, as a present to Mr. Dundas. This was afterwards purchased for £700, and exhibited at Exeter 'Change and also about England generally. Another animal, which was



SKELETON OF THE RHINOCEROS.

destined for the menagerie of the Emperor of Germany, arrived from India in 1800, but died in London soon after its arrival. It was dissected by Mr. Thomas, and his observations thereon were published in the "Philosophical Transactions." Shortly afterwards an eighth arrived, which subsequently went to Germany. Since this it has become common in the Zoological Gardens in various parts of Europe, and, in 1878, the genus was represented in the Regent's Park by no less than five different species and varieties.

The skeleton of the Rhinoceros, viewed generally, has a resemblance to that of the little Hyrax, the Tapir, and the Horse. The skull is much elevated at the base, being somewhat of a pyramidal form, and the nasal bones curve upwards and downwards, and are of such a size and thickness, in order to support one or more immense horns, that they are quite unparalleled for their development in any other existing quadruped. The nasal bones, together with the pre-maxillary and maxillary bones, form the general contour for the external apertures of the nostrils. This is peculiar, and found in no other animal, with the exception of the Tapir.

The Rhinoceros has no canine teeth; the incisor teeth vary, not only in regard to their form and proportions, but also their existence; and in the varieties of these teeth we may discern the same inverse relation to the development of the horns which is manifested by the canines of the Ruminants. Thus, the two-horned Rhinoceroses of Africa, which are remarkable for the great length of one or both of the nasal weapons, have no incisors in their adult dentition; neither had the great extinct hairy

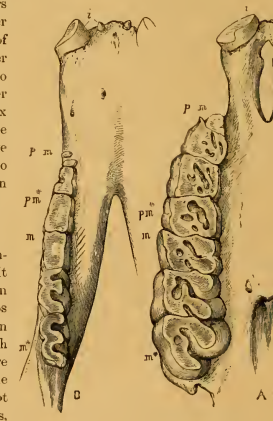
* *Philosophical Transactions*, xlii.

species (*Rhinoceros tichorhinus*), though that the latter had great horns is proved by the nature of the bones of the nose and face which supported their weight. The Sumatran bicorn Rhinoceros combines, with comparatively small horns, moderately developed incisors in both jaws.

FEMUR OF RHINOCEROS.

The sternum of the mature animal consists of four bones, the first of which is compressed into a ploughshare-like shape, and projects in a point in front of the first rib. All the bones of the fore limbs of the Rhinoceros resemble those of the Tapir more than those of any other animal; but from their much larger size are not at all likely to be confounded with them. Of the hind limbs, the points offering peculiarities are as follows:—The femur is remarkable for being extremely flattened from before backwards, and the projection called by Cuvier the third trochanter projects very much, forming a hook ascending towards a hook which descends from the projection known as the grand trochanter, thereby leaving an oval hole between these two projections. With regard to the lower portions of the hind leg, resemblances are to be found both to the Horse and Tapir, the tibia, fibula, and tarsus being built on the same plan as those of the former, although some of the bones of the tarsus resemble those of the Tapir more than they do those of the Horse. There are also some points of resemblance in the metatarsus to that of both the Horse and Tapir. The difference between the hind legs of the Rhinoceros and Elephant is very marked, and their gait is different.

The dentition of the Rhinoceros differs in a very remarkable degree from that of the family of Horses. The grinders are implanted by distinct roots, and in the upper jaw their crowns are traversed by two deep folds of enamel, which constitute open valleys. In the lower jaw they are composed of two crescent-shaped lobes, also open. The covering of "cement" is thin, and never fills up the valleys, as in the case of the more complex dental system in the Horse. The normal number of the grinders is seven in each jaw, while the incisors, as we have already remarked, vary, not only in form, but also are sometimes absent, and canines are not developed in any of the living or fossil members of the family.



DENTITION OF RHINOCEROS. A, UPPER; B, LOWER JAW.

THE AFRICAN RHINOCEROSES.

Of the number of species of Rhinoceros there is considerable doubt. At least four, possibly five, inhabit Africa, and four Asia. With regard to the African species, we will first take the large "WHITE" RHINOCEROS (*Rhinoceros simus*) described by Burchell. This is an animal measuring somewhat over twelve feet in length and about five feet ten inches in height. It has a square nose and two large rounded horns, the anterior one averaging about two feet six inches in length, but not uncommonly found measuring three feet six inches, sometimes even over four feet; the posterior rarely or never exceeding fifteen inches, and generally not being more than twelve inches. Its skin is smooth, and without any of those folds so characteristic of the Asiatic species. It inhabits all the country south of the Zambesi, and probably it may also exist in Central Africa. It feeds solely on grass, and sometimes collects into small herds.

OSWELL'S RHINOCEROS* in no way differs from *R. simus*, except that the front horn points

* *Rhinoceros Oswellii.*

forwards, and in some cases even downwards. This Mr. Drummond considers not to be a distinct species, but only an accidental and local variety.

The so-called Black Rhinoceros (*Rhinoceros bicornis major*) is a much smaller animal than *R. simus*, being about eleven feet in length and five feet in height, with an elongated head and horns thicker in proportion to length than those of *R. simus*. The front horn is twenty inches or

"WHITE" RHINOCEROS.

twenty-two inches in length, and never attains to more than twenty-six or twenty-eight inches; while the back horn averages ten inches or twelve inches. Its skin is not black, but flesh-coloured, and the upper lip is highly prehensile. The first specimen ever brought to Europe was captured in Upper Nubia in 1868, and was provided with a lodging in the Regent's Park Zoological Gardens. It is found in all the country south of the Zambesi; inhabits thorn thickets chiefly (in which *R. simus* is never found), but occasionally occurs in other jungle or open ground. It feeds chiefly on thorn leaves and branches, though also eating grass, for the plucking of which its flexible upper lip is as well fitted as the long tongue of the Giraffe. It is gregarious, five or six being sometimes found together.

The Keitloa, or Sloan's Rhinoceros (*Rhinoceros keitloa*), differs but little from *R. bicornis major*,

excepting in the formation of the head, which is somewhat shorter and broader, and it has a less prehensile lip. Its chief characteristic is the posterior horn, which is flattened at the sides, being of almost equal length to the anterior, and even occasionally longer, twenty inches and twenty-two inches being about the average. It is found sparingly in all the country south of the Zambesi, and is not gregarious, a bull and cow only being usually seen together. RHINOCEROS BICORNIS MINOR is the smallest,

KEITLOA.

being seldom over ten feet in length, or more than four feet ten inches in height. The head is more elongated and the nose more prehensile than in any other species, while the legs are shorter in proportion and the feet smaller. The anterior horns rarely exceed twelve inches, and the posterior seven or eight inches. It is usually found only between Zululand and the Limpopo river, although it has been killed farther north, not far from the Zambesi. It is not gregarious, two full-grown ones and a calf being the greatest number that has been recorded as seen together. It feeds on thorns, leaves, and shoots, and rarely, if ever, is found out of the thorn jungle.

Until recent times, it was universally believed that the hide of a Rhinoceros was too tough to allow a bullet to penetrate; indeed, even now in popular opinion the belief is still retained, but, like many popular opinions, it has been proved to be untrue; and that a Rhinoceros may be as easily shot

with an ordinary bullet as an Ox is fully established on the authority of Gordon Cumming, Sir S. Baker, Dr. Livingstone, and others.

Sir S. Baker, in his "Nile Tributaries," gives the following interesting account of a Rhinoceros hunt:—"We were leisurely returning home through alternate plains and low open forests of mimosa when Taher Sheriff, who was leading the party, suddenly reined up his Horse, and pointed to a thick bush, beneath which was a large, grey, but shapeless mass. He whispered, as I drew near, 'Oom qurrin' (mother of the horn), their name for the Rhinoceros. I immediately dismounted, and with the short No. 10 Tatham rifle I advanced as near as I could, followed by Suleiman, as I had sent all my gun-bearers direct home by the river when we had commenced our circuit. As I drew near, I discovered two Rhinoceroses asleep beneath a thick mass of bushes; they were lying like Pigs, close together, so that at a distance I had been unable to distinguish any exact form. It was an awkward place: if I were to take the wind fairly, I should have to fire through the thick bush, which would be useless; therefore I was compelled to advance with the wind direct from me to them. The aggageers remained about a hundred yards distant, while I told Suleiman to return, and hold my Horse in readiness with his own. I then walked quietly to within about thirty yards of the Rhinoceroses, but so curiously were they lying that it was useless to attempt a shot. In their happy dreams they must have been suddenly disturbed by the scent of an enemy, for, without the least warning, they suddenly sprang to their feet with astonishing quickness, and with a loud and sharp whiff, whiff, whiff! one of them charged straight at me. I fired my right-hand barrel in his throat, as it was useless to aim at the head, protected by two horns at the nose. This turned him, but had no other effect, and the two animals thundered off together at a tremendous pace. Now for a 'tally ho!' Our stock of gum was scattered on the ground, and away went the aggageers in full speed after the two Rhinoceroses. Without waiting to re-load, I quickly remounted my Horse Tétel, and, with Suleiman in company, I spurred hard to overtake the flying Arabs. Tétel was a good strong cob, but not very fast; however, I believe he never went so well as upon that day, for, although an Abyssinian Horse, I had a pair of English spurs, which worked like missionaries, but with a more decided result. The ground was awkward for riding at full speed, as it was an open forest of mimosas, which, although wide apart, were very difficult to avoid, owing to the low crowns of spreading branches; these, being armed with fish-hook thorns, would have been serious on a collision. I kept the party in view until, in about a mile, we arrived upon open ground. Here I again applied the spurs, and by degrees I crept up, always gaining, until I at length joined the aggageers. Here was a sight to drive a hunter! The two Rhinoceroses were running neck and neck, like a pair of Horses in harness, but bounding along at tremendous speed within ten yards of the leading Hamram. This was Taher Sheriff, who, with his sword drawn and his long hair flying wildly behind him, urged his Horse forward in the race, amid a cloud of dust raised by the two huge but active beasts, that tried every sinew of the Horses. Rodur Sheriff, with the withered arm, was second; with the reins hung upon the hawk-like claw that was all that remained of a hand, but with his naked sword grasped in his right, he kept close to his brother, ready to second his blow. Abou Do was third; his hair flying in the wind, his heels dashing against the flanks of his Horse, to which he shouted in his excitement to urge him to the front, while he leant forward with his long sword, in the wild energy of the moment, as though hoping to reach the game against all possibility. Now for the spurs! and as these, vigorously applied, screwed an extra stride out of Tétel, I soon found myself in the ruck of men, horses, and drawn swords. There were seven of us, and passing Abou Do, whose face wore an expression of agony at finding that his Horse was failing, I quickly obtained a place between the two brothers, Taher and Rodur Sheriff. There had been a jealousy between the two parties of aggageers, and each was striving to outdo the other; thus Abou Do was driven almost to madness at the superiority of Taher's Horse, while the latter, who was the renowned hunter of the tribe, was determined that his sword should be the first to taste blood. I tried to pass the Rhinoceros on my left, so as to fire close into the shoulder my remaining barrel with my right hand, but it was impossible to overtake the animals, who bounded along with undiminished speed. With the greatest exertion of man and horses, we could only retain our position within about three or four yards of their tails—just out of reach of the swords. The only chance in the race was to hold the pace until the Rhinoceroses should begin to flag. The Horses were pressed to the utmost; but we had already run about two miles, and the game showed no signs of giving in. On

THE RHINOCEROS HUNT.

they flew—sometimes over open ground, then through low bush, which tried the Horses severely; then through strips of open forest, until at length the party began to tail off, and only a select few kept their places. We arrived at the summit of a ridge, from which the ground sloped in a gentle inclination for about a mile towards the river; at the foot of this incline was thick, thorny, *nabbuk* jungle, for which impenetrable covert the Rhinoceroses pressed at their utmost speed. Never was there better ground for the finish of a race; the earth was sandy, but firm, and as we saw the winning post in the jungle that must terminate the hunt, we redoubled our exertions to close with the unflagging game. Suleiman's Horse gave in—we had been for about twenty minutes at a killing pace. Tétel, although not a fast Horse, was good for a distance, and we now proved his power of endurance, as I was riding at least two stone heavier than any of the party. Only four of the seven remained; and we swept down the incline, Taher Sheriff still leading, and Abou Do the last! His Horse was done, but not the rider; for, springing to the ground while at full speed, sword in hand, he forsook his tired Horse, and, preferring his own legs, he ran like an Antelope, and for the first hundred yards I thought he would really pass us and win the honour of first blow. It was of no use; the pace was too severe, and, although running wonderfully, he was obliged to give way to the Horses. Only three now followed the Rhinoceroses. Taher Sheriff, his brother Rodur, and myself. I had been obliged to give the second place to Rodur, as he was a mere Monkey in weight; but I was a close third. The excitement was intense; we neared the jungle, and the Rhinoceroses began to show signs of flagging, as the dust puffed up before their nostrils, and, with noses close to the ground, they snorted as they still galloped on. 'Oh for a fresh Horse!' We were within two hundred yards of the jungle; but the Horses were all done. Tétel reeled as I urged him forward; Rodur pushed ahead; we were close to the dense thorns, and the Rhinoceroses broke into a trot; they were done! Away went Taher; he was close to the very heels of the beasts, but his Horse could do no more than his present pace; still he gained upon the nearest; he leaned forward, with his sword raised for the blow—another moment and the jungle would be reached! One effort more, and the sword flashed in the sunshine, as the rearmost Rhinoceros disappeared in the thick screen of thorns, with a gash about a foot long upon his hind-quarters. Taher Sheriff shook his bloody sword in triumph above his head; but the Rhinoceros was gone—we were fairly

RHINOCEROS.

(*From the Living Specimen in the Zoological Gardens, London.*)

beaten, regularly outpaced. Taber Sheriff explained that at all times the Rhinoceros was the most difficult animal to sabre, on account of his extraordinary swiftness, and, although he had killed many with the sword, it was always after a long and fatiguing hunt, at the close of which the animal, becoming tired, generally turned to bay, in which case one hunter occupied his attention, while another galloped up behind and severed the hamstring. The Rhinoceros, unlike the Elephant, can go very well upon three legs, which enhances the danger, as one cut will not utterly disable him."

Not unfrequently, however, it is the hunter who has to fly away before the Rhinoceros, as Sir S. Baker found out to his cost in the Upper Nile.

Gordon Cumming, in his "Hunter's Life in South Africa," gives the following details of the Rhinoceros:—"Of the Rhinoceros there are four varieties in South Africa, distinguished by the Bechuanas by the names of the Borèlé, or Black Rhinoceros; the Keitloa, or Two-horned Black Rhinoceros; the Muchocho, or common White Rhinoceros; and the Robaoba, or Long-horned White Rhinoceros. Both varieties of the Black Rhinoceros are extremely fierce and dangerous, and rush headlong and unprovoked at any object which attracts their attention. They never attain much fat, and their flesh is tough, and not much esteemed by the Bechuanas. Their food consists almost entirely of the thorny branches of the waitabit thorns. Their horns are much shorter than those of the other varieties, seldom exceeding eighteen inches in length. They are finely polished with constant rubbing against the trees. The skull is remarkably formed, its most striking feature being the tremendously thick ossification in which it ends above the nostrils. It is on this mass that the horn is supported. The horns are not connected with the skull, being attached merely by the skin, and they may thus be separated from the head by means of a sharp knife. They are hard and solid throughout, and are a fine material for various articles, such as drinking-cups, mallets for rifles, handles for turners' tools, &c., &c. The horn is capable of taking a very high polish. The eyes of the Rhinoceros are small and sparkling, and do not readily observe the hunter, provided he keep to leeward of them. The skin is extremely thick, and only to be penetrated by bullets hardened with solder. During the day the Rhinoceros will be found lying asleep, or standing indolently in some retired part of the forest, or under the base of the mountains, sheltered from the power of the sun by some friendly grove of umbrella-topped mimosas. In the evening they commence their nightly rambles, and wander over a great extent of country. They usually visit the fountains between the hours of nine and twelve o'clock at night, and it is on these occasions that they may be most successfully hunted and with the least danger. The Black Rhinoceros is subject to paroxysms of unprovoked fury, often ploughing up the ground for several yards with its horn, and assaulting large bushes in the most violent manner. On these bushes they work for hours with their horns, at the same time snorting and blowing loudly, nor do they leave them in general until they have broken them in pieces. All the four varieties delight to roll and wallow in the mud, with which their rugged hides are generally encrusted. Both varieties of the Black Rhinoceros are much smaller and more active than the white, and are so swift that a Horse with a rider on his back can rarely overtake them. The two varieties of the White Rhinoceros are so similar in habits that the description of one will serve for both; the principal difference consisting in the length and set of the anterior horn: that of the Muchocho averaging from two to three feet in length, and pointing backwards; while the horn of the Robaoba often exceeds four feet in length, and inclines forward from the nose at an angle of 45°. The posterior horn of either species seldom exceeds six or seven inches in length. The Robaoba is the rarer of the two, and it is found very far in the interior, chiefly to the eastward of the Limpopo. Its horns are very valuable for loading-rods, supplying a substance at once suitable for a sporting implement and excellent for the purpose. Both these varieties of Rhinoceros attain an enormous size. They feed solely on grass, carry much fat, and their flesh is excellent, being preferable to beef. They are of a much milder and more inoffensive disposition than the Black Rhinoceros, rarely charging their pursuer. Their speed is very inferior to that of the other varieties, and a person well mounted can overtake and shoot them. The head of these is a foot longer than that of the Borèlé. They generally carry their heads low; whereas the Borèlé, when disturbed, carries his very high. Unlike the Elephants, they never associate in herds, but are met with singly or in pairs. In districts where they are abundant from three to six may be found in company; and I once saw upwards of a dozen congregated together on some young grass; but such an occurrence is rare."

Gordon Cumming relates that the Rhinoceros and Hippopotamus are usually attended by little birds known as Rhinoceros Birds, "their object being to feed upon the ticks and other parasites that swarm upon these animals. They are of a greyish colour, and are nearly as large as a common Thrush. Their voice is very similar to that of the Mistletoe Thrush. Many a time have these ever-watchful birds disappointed me in my stalk, and tempted me to invoke an anathema upon their devoted heads. They are the best friends the Rhinoceros has, and rarely fail to awaken him even in his soundest nap. 'Chukuroo' perfectly understands their warning, and, springing to his feet, he generally first looks about him in every direction, after which he invariably makes off. I have often hunted a Rhinoceros on horseback which led me a chase of many miles, and required a number of shots before he fell, during which chase several of these birds remained by the Rhinoceros to the last. They reminded me of mariners on the deck of some bark sailing on the ocean, for they perched along his back and sides; and as each of my bullets told on the shoulder of the Rhinoceros, they ascended about six feet into the air, uttering their harsh cry of alarm, and then resumed their position. It sometimes happened that the lower branches of trees, under which the Rhinoceros passed, swept them from their living deck, but they always recovered their former station. They also adhere to the Rhinoceros during the night. I have often shot these animals at midnight when drinking at the fountains, and the birds, imagining they were asleep, remained with them till morning; and on my approaching, before taking flight, they exerted themselves to their utmost to awaken Chukuroo from his deep sleep."

THE ASIATIC RHINOCEROSES.

There are four different Rhinoceroses in Asia, of which two are characterised by the possession of one horn, while the remaining two possess two horns, as in the African species. All the adult Asiatic possess incisors or front teeth, which are conspicuous by their absence from the African species. The normal number of these is four in the upper, and four in the lower jaws, the median pair being the larger in the upper, and the smaller in the lower. The development of these teeth seems to stand in relation to the development of horns, those animals with the smallest horns being provided with the largest incisors. The most familiar is the INDIAN RHINOCEROS (*Rhinoceros unicornis* = *R. indicus*, Cuvier), with a single horn on the nose, and thick naked skin covered with large boss-like granulations, which lies in massive folds on various parts of the body, and more especially behind and across the shoulders and before and across the thighs. There are a few stiff hairs on the tail and ears. It inhabits the East Indies, principally beyond the Ganges, and is recorded as having been found in Bengal, Siam, and Cochin-China. It is found in shady forests, the neighbourhood of rivers, and marshy places, its food consisting of herbage and branches of trees. The fully-grown animal rarely arrives at a greater height than five, and its average may be taken at four feet.

FRONT AND SIDE VIEWS OF HEAD OF SUMATRAN RHINOCEROS.
(From the *Proceedings of the Zoological Society.*)

Williamson, in his "Oriental Field Sports," speaking of the Indian Rhinoceros, describes it as an inveterate enemy of Elephants, attacking whenever he can find them single, or, at least, not protected by a male of great bulk; ripping without mercy, and confiding in his coat of mail to defend him from the puny attacks of the females, as well

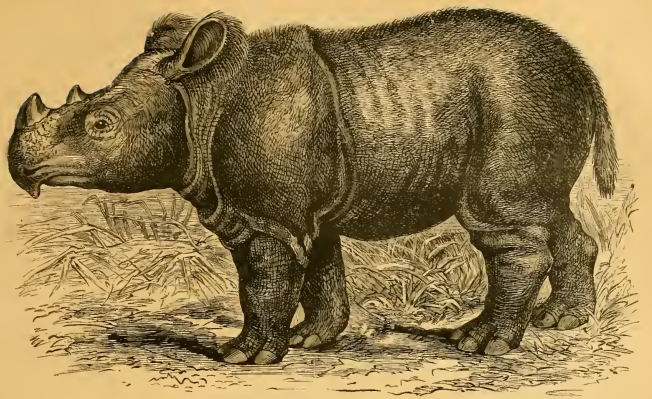
INDIAN RHINOCEROS.

as to resist the tusks of young males. He relates that the apparent bluntness of the horn of the Indian Rhinoceros, which is about as broad at the base as it is high, would make it appear a somewhat insignificant weapon, and inadequate to penetrate any hard or tough substance. This, however, we are informed, is not the case, Elephants often being found dead, obviously, it is stated, from the wounds received from the horn of the Rhinoceros; and in one case, as is related by Williamson, a large male Elephant and Rhinoceros were found both dead together, the Elephant's abdomen having been ripped open, and the Rhinoceros's horn found transfixed beneath the ribs. Williamson also states that Major Lally, an officer of the Indian army, whose veracity is beyond question, while engaged in one of his hunting expeditions, and having arrived at the summit of a low range of hills, was suddenly presented with a distinct view of a most desperate engagement between a Rhinoceros and a large male Elephant, the latter, to all appearance, protecting a small herd which were retiring in a state of alarm. The Elephant was beaten, and decamped, followed by the Rhinoceros, into a heavy jungle, where much roaring was heard, but nothing could be discerned. From this we may conclude that the habit which Pliny describes of the Rhinoceros ripping open the Elephant is confirmed by modern observation.

The Javan Rhinoceros (*R. sondaicus* = *R. javanus* of Cuvier) is a smaller representative of the Indian Rhinoceros, with the skin not so coarsely granulated, and the folds not so strongly marked. It is covered with a sparse growth of bristles, and its head and limbs are longer and more slender in their proportions than in the latter species. It inhabits Java and the Malay Peninsula, and the Sunderbunds of Bengal, living on herbage and the branches of trees.

The Sumatran Rhinoceros (*R. sumatrensis* of Cuvier) is the more commonly known of the two two-horned species inhabiting Asia. Its head is armed with two obtusely-pointed horns, its body is covered with bristles, and the folds of the skin are deep, and especially that behind the shoulder. The folds on the neck, however, are not so distinct as in the one-horned species.

The Hairy-eared Rhinoceros (*R. lasiotis*) has been confounded by naturalists with the Sumatran species, until Dr. Sclater showed from the comparison of these two animals, in the Zoological Gardens, that they were specifically distinct. The former is characterised by the long hairy fringe to the ears, by the covering of long fine reddish hair on the body, the smoother and more finely granulated skin, and the shorter tail. The one in Regent's Park was captured in January, 1868, under very singular circumstances, as described in the following extract from a Calcutta newspaper:—"The quiet station of Chittagong has been lately enlivened by the presence of a Rhinoceros. It appears that about a month ago some natives came into Chittagong and stated that a Rhinoceros had been found by them in a quicksand, and was quite exhausted with the efforts to relieve herself. They had attached two ropes to the animal's neck, and with the assistance of about 200 men dragged her out, and keeping her taut between two ropes they eventually made her fast to a tree. The next morning, however, they found the Rhinoceros so refreshed, and making such efforts to free herself, that they were frightened, and made application to the magistrate of Chittagong for protection. The same evening Captain Hood and Mr. H. W. Wickes started with eight Elephants to secure the prize, and after a march of about sixteen hours to the south of Chittagong they came up with the animal. The Elephants, at the first sight of the Rhinoceros, were very much afraid, and bolted one and all, but after some exertion they were brought back and made to stand by. A rope was now with some trouble attached to the animal's hind leg, and secured to an Elephant. At this juncture the Rhinoceros roared; the Elephants again bolted, and had it not been for the rope slipping from the leg of the Rhinoceros, that limb might have been pulled from the body. The Rhinoceros was, however, eventually secured with ropes between Elephants, and marched into Chittagong in perfect health. Two large rivers had to be crossed—first the Sungoo River, where the animal was towed between Elephants, for she could not swim, and could only just keep her head above water by paddling with the fore-feet like a Pig; and, secondly, the Kurnafoolie River, when the ordinary cattle ferry-boat was used. Thousands of natives thronged the march in, which occupied a few days, the temporary bamboo bridges on the Government road invariably falling in with the numbers collected thereon to watch the Rhinoceros crossing the stream below: and sometimes the procession was at least a mile in length. The 'Begum,' as the Rhinoceros has been named, is now free from all ropes, and kept within a stockade enclosure, having therein a good bath excavated in the ground, and a comfortable covered shed attached. She is already very tame, and will take plantain leaves or chupatties from the hand,



HAIRY-EARED RHINOCEROS. (From the *Proceedings of the Zoological Society.*)

and might almost be led about by a string." Begum was ultimately brought to London, and sold to the Zoological Society for £1,250.

THE FOSSIL RHINOCEROSES.

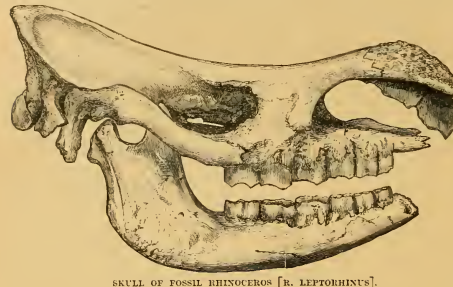
Although the species of Rhinoceroses living at the present time are but few, the researches of palæontologists show us that in past time the number of species was considerable, and that they were not, as now, confined to the warmer parts of the Old World, but were distributed over a large portion of Northern Asia and Europe.

The first representative of the Rhinoceros family is the *Orthocynodon*, an animal with large upright canines, discovered in the Upper Eocene strata of the United States. The fossil Rhinoceroses properly so called are first found in the Miocene, and are divided into four groups. The first group is characterised by the nostrils being separated by a bony partition, and in the adult animal the incisor teeth are lost: the second is distinguished by the absence of a bony partition between the nostrils, and the incisor teeth are of a medium size: in the third there is no partition, but the incisors are large; and in the fourth it is imperfectly developed.

An example of the first group, and probably the best known form of all the extinct Rhinoceroses, is *Rhinoceros tichorhinus*, or the Woolly Rhinoceros. Like that of the Mammoth, with which animal it was evidently associated, its entire body was covered with hair and wool, the skin had no folds, and its nose carried two horns, the anterior of which was of remarkable size, and characteristic of the group to which it belongs; the nostrils were separated by a complete bony partition. The Woolly Rhinoceros has been discovered under similar circumstances to that of the Mammoth, having been found embedded in ice in the northern latitudes of Asia, in the years 1771 or 1772, being some twenty years previous to that of the discovery of the first Mammoth by a fisherman named Schumachoff. According to Pallas, the discovery was made by some Yakuts, who were on a hunting expedition, and took its dimensions on the spot; it was about eleven and a half feet in length. Its body was still clothed with skin, but altogether the animal was so far decomposed that not more than the head and feet could be brought away. On the skin many short hairs still remained. The range of the Woolly Rhinoceros was undoubtedly the same as that of the Mammoth, except that it did not cross Behring Strait, and, consequently, its remains are not found in America. The remains of the Woolly Rhinoceros are found in numerous

caves in association with the remains of Hyænas, having undoubtedly been a staple article of food for these animals. In England remains have been found in the caves at Creswell, Nottinghamshire; in the Brixham Cave; in Kent's Hole, near Torquay, Devonshire; and in Wookey Hole, near Wells, Somerset, as well as in the caves of Wales and Derbyshire.

As an example of the second group, we have *Rhinoceros megarhinus* of the Pliocene and Pleistocene strata. This animal possessed two horns. Its remains are found in France and Italy, and in the pre-glacial forest bed of Cromer, and in the lower brick earths of the Thames valley. *Rhinoceros incisivus* represents the third group in Miocene times. It had no bony septum between the nostrils, the incisors are large, and there are four toes on the fore-foot. Of the fourth group the best examples are *R. etruscus* and *R. leptorhinus*. The former of these possessed two horns, and the nostrils were separated by an imperfect bony septum. Its remains are found in various Pliocene and Pleistocene deposits. The latter also possessed two horns, and its nostrils were divided by a thin and delicate bony partition, which can only be termed imperfect in comparison with the massive partition in the Woolly Rhinoceros. It is devoid of incisors. This species is found in Pleistocene deposits in Britain, France, and Italy, in caverns, and in river-beds, the most perfect remains being met with in the valley of the Thames near Ilford. These were collected by Sir Antonio Brady, and are now to be seen in the British Museum. In the figure the fragile nose septum is represented as broken.



SKULL OF FOSSIL RHINOCEROS [R. LEPTORHINUS].

The genus *Aceratherium*, of Kaup, is a hornless Rhinoceros, found in the same Miocene strata as the *R. incisivus*. Like the latter, it possesses incisors, and, not improperly, may be considered as a female of the latter species, if the horn be viewed as a sexual characteristic: first of all in the possession of the male, and afterwards transferred by descent, in the case of all the Post-Miocene Rhinoceroses, to the female.

THE EXTINCT FAMILY PALÆOTHERIDÆ.

The Palæotheridæ, or fourth family to be considered under the head of the Perissodactyla, is that which is found only in the fossil state in the Eocene strata of Europe and North America. They are allied, on the one hand, to the Horses, and on the other to the Tapirs. The type of the family, the Pelæotherium, was originally discovered by Cuvier in the quarries of Montmartre, near Paris. The grinding teeth closely resemble, in the pattern of their grinding surfaces, those of the Rhinoceros. The full complement, however, of incisors and canines, as well as of grinders, is present in each jaw, namely—Incisors, 3; canines, 1; premolars, 4; molars, 3. These animals varied in size from that of a Roedeer to that of a Tapir, and were possessed of three well-developed hoof-bearing toes.

The genus Macrauchenia is also an extinct form, constituting a separate family, Macraucheniadæ, peculiar to the later Tertiaries of South America. Its skull is, on the whole, like that of the Horse, but the nasal bones are short and like those of the Tapir. It possessed a long neck, like the Llamas, and a full complement of teeth, partly equine, partly resembling those of Rhinoceros. Both fore and hind feet were furnished with three toes.

W. Boyd Dawkins.
H. W. Oakley.

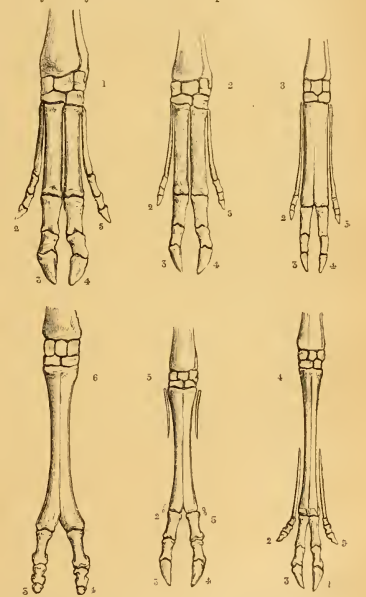
CHAPTER III.

ARTIODACTYLA—THE PIG OR HOG FAMILY.

Introductory Remarks on the Artiodactyla—Character of their Feet—The Wanting Digit—Comparison of the Bones of the Fore Feet of Representative Animals—Other Characters in the Artiodactyla—Classification—SUIDÆ, OR HOG FAMILY—Groups of the Family—Snout—Sense of Smell—Libels—Mention in the Bible—Among the Jews—Range—Teeth—THE WILD BOAR—General Features—Habits—Historical Mention—THE INDIAN HOG—Habits—A Wild Boar Hunt—A Noble Foe—THE DOMESTIC HOG—The "Irish Greyhound Pig"—Effects of Domestication—THE SOLID-HOOFED BREED OF PIGS—Description of the Bones of Foot—MASKED PIG—BUSH HOG—BABIRUSA—THE WART HOGS—ÆLIAN'S WART HOG—THE ETHIOPIAN WART HOG—PECCARIES—Habits—Dentition—Feet—Species—THE FOSSIL HOGS.

SUB-ORDER ARTIODACTYLA.

BESIDES the Perissodactyla there is another large group of animals in which the extremities of the fore and hind toes are entirely surrounded by horny tissue in the shape of hoofs. These are the Artiodactyla, or cloven-hoofed animals, which differ from the Perissodactyla in the manner in which the weight of the body is carried upon the feet. In the Artiodactyla the toes are even in number, being four in all the feet, except in the Camel tribe, the Giraffe, and a very few Antelopes, in which only two are present. It is the digit which corresponds to the human thumb in the fore foot, and to the great toe in the hind, which is always deficient, the inner and the outer digits (the second and the fifth) being frequently reduced to but minute rudiments, as in the Sheep and Ox. Some may ask how we know that it is the thumb and the great toe which are missing, and not the little finger or toe, for instance. A glance at the human hand and foot will explain the point. Counting the bones in the thumb or great toe, it will be found that there are but two bones beyond the limit of the "ball of the thumb," or the free part of the great toe, whilst in all the other fingers and toes three bones can be counted. A reference to Fig. 3 makes it evident that in the Artiodactyla there figured, as in all others, each toe has three bones in it; and as all mammalian animals which have five toes agree with man in possessing one less bone in the inner toe than in any of the others, it is but logical to conclude that when four toes only are present, all possessing an equal number of bones, the one absent is that corresponding to the thumb and great toe. Each foot is always symmetrical in itself, at the same time that its imaginary axis, which is the line drawn down the middle of it, runs between the two medial toes, they corresponding with the third and fourth of the human limb. The accompanying drawings of the bones of the fore-foot of the Pig, the Water Chevrotain (or Deerlet), the Javan



BONES OF THE LEFT FORE LIMB OF (1) COMMON PIG, (2) AFRICAN DEERLET, (3) JAVAN DEERLET, (4) ROEBUCK, (5) COMMON SHEEP, (6) CAMEL.*

(From Specimens in the Museum of the Royal College of Surgeons.)

* The numbers in each figure refer to the digits, the thumb being always absent. The seven square-shaped bones above the digits in each figure constitute the wrist or carpus. Above these are the large radius, and the small ulna in some.

Chevrotain, the Roebuck, the Sheep, and the Camel, illustrate, better than can be done by words, the difference in the degree of development of the outer toes found in the group. In the Pig all the four toes are well developed, and there is no consolidation of their constituent elements. In the Water Deerlet of West Africa the external toes are smaller, whilst, as in the Pig, each metacarpal—which is in the human hand the part of each finger included within the palm—is independent of its neighbour, the Javan Deerlet differing in having the third and fourth fused into a "cannon" bone. But in the Red Deer the reduction of the second and fifth digits is so great that their metacarpals are not perfect, being only present in their upper parts; whilst the phalanges, or lower bones, are very small, being reduced in the Sheep to mere bony spots with minute hoofs, which latter are quite absent in the Camel, Llama, Giraffe, and Pronghorn Antelope.

There are numerous other characters which associate these animals, and prove the natural affinities of the different species, at the same time that in geologic times there existed other creatures which fill up the intervals between existing forms, and conclusively demonstrate the manner in which the order has been evolved from a common type in times long past.

All the Artiodactyla are strictly terrestrial, none being arboreal in their habits. The Hippopotamus is the only member of the group which is aquatic, spending much of its life in the water, without, however, any special modification of its limbs or tail like that found in the more truly aquatic Seals, Sirenia, or Whales.

There is a great uniformity throughout the order in the general plan upon which the limbs are constructed. In all the species the wrist in the fore limb—commonly called the knee—and the heel in the hind limb—the hock—is raised a considerable distance above the ground, at the same time that the whole weight of the body is carried upon the extreme tips of the toes, the terminal bones of which are expanded within the hoof to increase the basis of support. The collar-bone is absent in all, as it is in nearly every animal that does not use its fore limbs for any other purpose than that of carrying the weight of the front parts of its body.

In the Perissodactylate Rhinoceros the horn or horns is or are situated in the middle line of the face above the nose, and are not supported upon any bony horn core. In all those Artiodactyla which carry horns or antlers, there are appendages paired and lateral in position, at the same time that they are either supported upon bony cores, or are formed of bone itself, and are situated upon the forehead.

The following table best represents our present knowledge as to the classification of the Artiodactyla :—

ORDER UNGULATA
- Sub-order Artiodactyla
  - Non-ruminants
    - Pigs of the Old World.
    - Peccaries of the New World.
    - Hippopotami.
  - Ruminants
    - Camels.
    - Llamas.
    - Chevrotains or Deerlets.
    - Bovidæ (Oxen).
    - Cervidæ (Deer).

A. H. Garrod.

I.—SUIDÆ, OR HOG FAMILY.

The Non-Ruminantia, or Artiodactyls which do not chew the cud, possess the following characters: they usually have more than one pair of incisors in the upper jaw, they are devoid of horns, and the stomach has rarely more than two divisions. In only one genus, that of the Peccary, are the metatarsal and metacarpal bones united into one compact bony mass. They are divisible—as the above table indicates—into three families: the Suidæ, or Hogs, the Hippopotamidæ, or Hippopotamuses, and the Anoplotheridæ,* or Anoplotheres, an extinct family, met with only in the Eocene strata of the Old and New Worlds.

* ἀ, without; ὅπλή, a hoof; θηρίον, wild beast; wild beast without hoof.

The Hog family may be divided into three well-marked groups:—1, the True Swine, consisting of three genera, Sus, Potamocherus, and Babirusa; 2, the Wart Hogs, represented by one genus, Phacochœrus; and 3, the Peccaries, represented also by one genus, Dicotyles. They have three kinds of teeth—incisors, canines, and boss-covered or transversely ridged grinders—slender limbs, and the third and fourth toes are considerably larger than the second and fifth.

In order to enable the Hog family to "root" or turn up the ground, they are provided with a truncated and cylindrical proboscis, or snout, which is capable of considerable movement. The skin is more or less supplied abundantly with hair, and the tail is short, and in some cases merely represented by a tubercle.

The sense of smell in the Hog is very acute, and when its broad snout ploughs up the herbage, not a root, an insect, or a worm, escapes the olfactory sense. Although credited with stupidity, the Hog in its native state is to be styled anything but a dull and lethargic animal, neither is it the filthy animal that domestication has reduced it to. Properly cared for, the Pig is as cleanly in its habits, and as capable of strong attachment, as any other creature.

No animal that is mentioned in the Bible—not even the Dog—is spoken of with more abhorrence than the Pig; and even at the present day a Jew or Mohammedan looks upon this creature with anything but a generous feeling, treating it as something utterly detestable. So great was the horror with which the older Jews regarded the Hog, that they would not even mention it by name, but called it "the abomination." The origin of the great antipathy which the Jews have always experienced for the Pig appears to be lost in antiquity. In Lev. xi. 7, the Hog is spoken of with other animals as being unclean and unfitted for food, simply because it did not chew the cud, although the hoof was divided. It has, however, been suggested that the Pig was so strictly prohibited by Moses from being eaten, on account of its flesh being supposed in a hot country to cause skin-diseases, and especially the dreaded leprosy; but it is to be doubted whether Moses is to be considered as the originator of the horror with which the Hog has been and still is regarded. It seems probable that this disgust dates from a period of far greater antiquity than that of Moses; and it is certain that the flesh of Swine can be eaten in hot countries without producing any bad effects. It is a matter of considerable wonder, that while Swine are held in such abhorrence, we read of herds being so often kept in Palestine. In the Gospel of St. Matthew (viii. 28–34), we read of a herd of Swine being entered by devils, and which, so possessed, rushed down a hill and were drowned in the sea. Again, in the parable of the Prodigal Son, we are told of his becoming a swineherd. Although Pigs were so much disliked, the Jews were evidently well acquainted with their habits, as we read in the Second Epistle of St. Peter (ii. 22), where the apostle refers to the fact of Pigs wallowing in the mire. It is also remarkable that with the exception of one passage in the Bible, the mention of the Hog is confined to those in a domesticated state, this exception being found in Psalm lxxx. 13: "The boar out of the wood doth waste it, and the wild beast of the field doth devour it."

The genus Sus, or Hog proper, ranges, in the wild state, over the greater portion of the Old World, through Central and Southern Europe into Central and Southern Asia, and as far to the east and south as New Guinea. It is also met with in the North African forests, in the region north of the Sahara desert. It is conspicuous by its absence from North and South America, Australia, and the cold northern regions of Europe and Asia.

The adult teeth in the True Hogs (genus *Sus*) are forty-four, of which there are in each jaw three incisors, one canine, four premolars, and three true molars. The canines are very variable in size, being reduced to a minimum under domestication, and arriving at a maximum in the wild males.

THE WILD BOAR* inhabits Europe, North Africa, and Hindostan, each country having its own peculiar type or race, which sometimes is so marked as to constitute separate species in the opinion of first-rate naturalists.

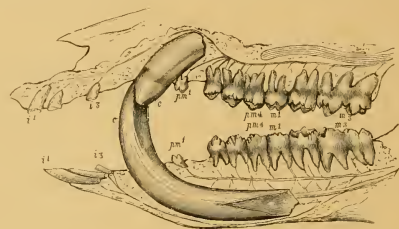
The Wild Boar is distinguished by a body generally of a dusky-brown or greyish colour, having a tendency to black, and being diversified with black spots. The canines or tusks in the male are long and powerful, and project beyond the upper lip, the mouth is large, and the elongated head is set on a short neck rising out of a thick and muscular body. The size is variable, an old Wild Boar recorded by Desmarest being five feet nine inches long, while a four-year-old of the more ordinary size measured

* *Sus scrofa.*

three feet without the tail. The female is smaller than the male, and with smaller tusks. The hairs of the body are coarse, intermixed with a downy wool. On the neck and shoulders the hairs take the form of bristles, being long enough to assume a kind of mane which the animal is enabled to erect if irritated. The young has the body marked with longitudinal stripes of a reddish colour.

In its habits the Wild Boar is by choice herbivorous, feeding on plants, fruits, and roots; but it will also eat Snakes, Lizards, and various insects, and when pressed by hunger nothing appears to come amiss to its voracious appetite; it is stated that even dead Horses are sometimes called into requisition. The Boar is nocturnal in its habits, rarely leaving the shadow of the woods in the day-time, and coming forth as twilight approaches in search of food, delighting in roots often deeply embedded in the soil, and which its keen sense of smell enables it easily to detect. Much mischief is often done by this animal, which ploughs up the ground in continuous furrows for long distances, and is not content, like the domesticated variety, with ploughing up a spot here and there.

The Wild Boar was formerly an inhabitant of Great Britain. According to Bell, "About the year 940, the laws of Hoel Dha direct that it shall be lawful for the chief of his huntsmen to chase the Boar of the woods from the fifth of the ides of November (9th), until the calends of December



DENTITION OF WILD BOAR.

(1st), Cap. xxi. sect. 14." In the next century Bell states that "the numbers had perhaps begun to diminish, since a forest law of William I., established in A.D. 1087, ordained that any who were found guilty of killing the Stag, the Roebuck, or the *Wild Boar*, should have their eyes put out; and sometimes the penalty appears to have been a painful death. It appears," continues Bell, "that Charles I. turned out some Wild Swine in the New Forest, for the purpose of restoring the breed to that royal hunting-ground; but they were all of them destroyed during the civil war. A similar attempt was made in Bere Wood, in Dorsetshire; but one of the Boars having injured a valuable Horse belonging to the worthy Nimrod who exhibited this specimen of sporting epicurism, he caused them to be destroyed."

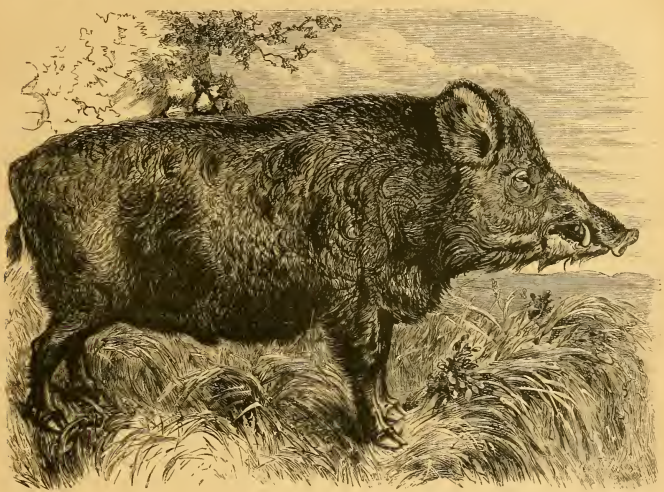
The Wild Boar probably became extinct in Britain before the reign of Charles I.; while in Ireland it was abundant as late as the seventeenth century.

The Indian Hog* differs but little in general appearance from the European Wild Boar, and is looked upon in the East as a most exciting object of the chase, its speed, endurance, and courage making it one of the most formidable and dangerous animals that can possibly be encountered.

The habits of this animal are admirably portrayed by Williamson, in his "Oriental Field Sports." After describing the extraordinary speed this creature is possessed of, equalling that of a good Horse, and asserting that a moderate-sized Hog can, and often does, overthrow Horses and their riders, he states that "The Wild Hog delights in cultivated situations; but he will not remain where water is not at hand, in which he may, unobserved, quench his thirst and wallow at his ease. Nor will he resort for a second season to a spot which does not afford ample cover, whether of heavy grass

* *Sus scrofa* (Indian variety).

or of underwood jungle, within a certain distance, for him to fly to in case of molestation, and especially to serve as a retreat during the hot season, as otherwise he would find no shelter. The sugar-cane is his great delight, both as being his favourite food, and as affording a high, impervious, and unfrequented situation. In these, Hogs commit great devastation, especially the breeding Sows, which not only devour, but cut the canes for litter, and throw them up into little huts, which they do with much art, leaving a small entrance which they stop up at pleasure. Sows never quit their young Pigs without completely shutting them up. This, indeed, is requisite only for a few days, as the young brood may be seen following the mother, at a round pace, when not more than a week or ten days old. The canes are generally planted about the end of May or beginning of June, in ground rendered extremely



WILD BOAR.

fine by digging. For this purpose cuttings of canes are buried horizontally, and with the first showers of the rainy season, which usually commences in the middle of June, the several joints throw out shoots that grow so rapidly, as often to be two or three feet high by the beginning of September. The red cane, called the *bun-ook*, which is not so valuable as the smaller or yellower sort, begins to ripen in September; by the end of which month it will have attained the height of seven or eight feet. These serve as the first receptacles for the Wild Hogs, which having suffered, since the harvest in March, all the inconveniences of bad diet, long nightly excursions, scarcity of water, great diurnal heat, and frequent disturbance, arrive among them in excellent running order. It should be observed that throughout India a custom prevails of setting fire to the grass jungles in the month of May, when they are completely dry, for the purpose of increasing the growth of the new grass, by the stimulus of the ashes which are washed in with the first showers in June." Williamson goes on to say that "the *bun-ook* is commonly cut in November, and the Hogs then shift to the yellow canes, which are by that time forward enough to serve as sufficient cover. Canes require much manure and excellent tillage;

consequently they are usually planted near to villages, and surrounded by fields of wheat, barley, and other grain. A species of lupin called *rhur* is cultivated in large quantities. It grows luxuriantly, generally to the height of eight or nine feet, forming quite a wilderness. . . . In these *rhur* fields Hogs delight, as they are completely umbrageous, but being open below, admit the air freely. Besides, this wild rice growing very thick among the *rhur*, and a kind of soft downy grass about a foot in height, they find themselves very comfortably situated. About the middle of March, or, at the latest, by the beginning of April, the Hogs must shift their quarters, the canes and grain being by this time generally cut. However, they often retain possession to the last moment, frequently disputing every inch with the reapers, and not rarely causing them to leave parts uncut, in the hope that the Hogs will evacuate them; which, if the jungle whither they must betake themselves happen to be remote, they feel no great disposition to do. For at this season the Hog is extremely heavy and indolent, in consequence of the abundance of the excellent food to which he has, for five or six months, been habituated. Hogs are often killed in March with three and four inches of fat on their chines and shoulders. Exclusive of the habits of ease in which he has so long indulged, it is probable the Hog feels diffident as to his want of exercise, and ability to travel under such a mass of flesh. Besides, he is extremely tenacious of the spot which has so long pampered him; and, although unable to proceed any distance without being blown, yet the short sallies he makes to attack such as venture near his haunt are marked with vigour and resolution. Sometimes he will do considerable mischief with his tusks. . . . Great numbers are at this season either caught in nets made for the purpose, or they are shot by the *shekarries*, or native sportsmen, a circumstance that never fails to afford a happy triumph to the affrighted villagers."

The Wild Boar of India is hunted usually by men on horseback, armed with spears of a more or less variable length, averaging from about six feet and a half to eight and sometimes ten feet. The shaft of a spear consists of bamboo properly weighted with lead; the spear itself is a broad and stout blade. It is held by a man on horseback in such a manner that about a foot and a half projects in front of the stirrup-iron, and the Horse is ridden in such a way that when the Boar charges it is transfixed by the spear.

An account of a Wild Boar hunt of an exceptionally interesting and exciting nature is related by Captain Shakespeare:—"While beating the sugar canes for Wild Hogs, a few miles from Hingolu, a villager came and said, 'If you want to see a Hog come with me;' and leading the way over the brow of a hill, pointed out an object in a field below, that in the mist of the morning appeared like a large blue rock, much too large for a Hog. However, the object presently got on its legs, and dissipated every doubt existing as to its character. About a hundred yards distant from the animal was a fissure in the hills, thickly wooded, and here, no doubt, was the Boar's lair; and if he took alarm and rushed thither, it would be next to impossible to dislodge him. A savage Boar in his stronghold is as difficult to oust as the Grizzly Bear from his winter cave in the Rocky Mountains. He constantly rushes out, knocks over and gores the beaters nearest the mouth of his retreat, and then skips back again before there is the shadow of a chance of spearing him."

After describing the way in which he managed to place himself between the Boar and his retreat, Captain Shakespeare continues:—

"Standing as I was, behind a hedge considerably higher than my mare's head, I did not see the Boar. The duffadar (native officer) was some thirty yards to my left, and looking over a lower part of the hedge, shouted out, 'Look out! here he comes!' The mare was standing still, and I had but just time to drop my spear point, which caught the Boar in the rise, and the blade was buried in his withers. My mare, from her standing position, cleared with one bound the Boar, spear and all, as this was carried out of my hand; then suddenly turning, was in her stride after the Hog. The Hog had but seventy yards to reach the jungle, and just as he struck the first branch of the jungle with his back, breaking in two the shaft of my spear (which was still fast in his body), the duffadar closed with him. The Boar, having been missed by the spear, ran under the duffadar's Horse, and for thirty yards lifted him off his legs, plunging and kicking till the rider came to the ground. Fortunately we had three Dogs with us; and having shouted to the people to let them go, they came up and took the attention of the Boar at the moment he was on the duffadar, who had fallen on his sword and broken it, and was utterly helpless. The next moment the Boar made full tilt for his stronghold, the Dogs

following close at his heels. Armed with a fresh spear, I rode up the face of the hill, and from thence looking down saw the Boar at bay and surrounded by the Hounds, but in such a situation that it was impossible on horseback to go to the assistance of the Dogs. At this moment one of the beaters came running up with a heavy double-barrelled rifle, and being apprehensive that the Hounds would be speedily slaughtered if not relieved, I took the gun, and dismounting, resolved to attack the Boar on foot. Just as I got to the bottom, I saw the monster Boar with his back to a tree, and the three Dogs looking very cautiously at him. He was about forty yards from me. Directly he saw me, putting his head a little down to take aim, he came straight at me, increasing his pace from

DOMESTIC SOW AND YOUNG.

the trot to the charge. When about fifteen yards off, he received the first bullet of my rifle in his neck, Taking not the least notice of it, he came on, and the second barrel fired at him, at about five yards, broke his left under jaw-bone at the tusk. Fortunately I brought my rifle down to the charge, and striking it with his head, the Boar sent me over on my back. While running over me he made a glance, and wounded me in the left arm. Had I not put down my rifle-barrel at the moment, most probably his tusks would have been buried in my body. As it was I had two shooting jackets on, it being a very cold morning, and I suffered more from the jar than the wound. As I lay, I seized the end of my rifle-barrel, determined to sell my life as dearly as possible. To my delight, I must say, I saw the Boar knock over the man who was running down with my big spear. He did not turn on either of us; for the Boar is a noble foe, rarely turning, unless desperately wounded and unable to go on, to mutilate a fallen enemy. The Dogs immediately tackled him, and permitted me, though almost breathless, to get up. The rifle-stock was cracked, and the pin that fastens the barrel into the stock much bent. Having put this to rights, I loaded, and, proceeding in the direction the Boar had gone,

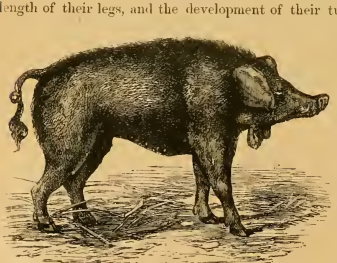
came up to within fifteen yards of where he had halted and stood regarding me vengefully. Taking aim I sent a bullet through his eye into his brain, and rolled him over dead. I have stated that the Boar is the most courageous animal in the jungle. There he was; with a broken spear in his withers, the shaft sticking up a foot and a half from the blade, knocking over a horseman and wounding his Horse; receiving two bullets—ten to the pound—the first in his neck and throat, the second breaking his jaw, and fired within a few feet of his muzzle; making good his charge, cutting down his enemy like grass, wounding him; knocking over a second man armed with a spear; defying the Dogs; and then, in the act of charging again, shot in the brain, and dying without a groan."

HEAD OF DOMESTIC PIG.

HEAD OF WILD BOAR.

THE DOMESTIC HOG is proved by the researches of Nathusius and Rütimeyer to be descended from two distinct wild stocks—the Wild Boar, and an Eastern type known now only in the domesticated condition, and named *Sus indica* by Pallas. The breeds of Hogs descended from the Wild Boar are to be found in various parts of Northern and Central Europe, and resemble their progenitors in the length of their legs, and the development of their tusk. The skull, however, has become higher and broader, and their tusks are not so large, and the body is not covered with such a dense coating of hair.

MILK DENTITION OF PIG.
d, deciduous or falling-out [milk] teeth.



IRISH GREYHOUND PIG. (*After Richardson.*)

The old "Irish Greyhound Pig," of Richardson, may be taken as an example of one of the domestic races descended from the Wild Boar. Sometimes in this breed, as in the Normandy Pigs, a peculiar pendant, about three inches long and covered with bristles, is to be seen attached to the corner of the jaw, as in the accompanying figure.

The domesticated breeds of China and Siam have, among other characters, broader and stouter heads than those which are descended from the Wild Boar, and are best known to Englishmen under the form of the Chinese breed. They constitute the type of *Sus indica*, which is now so largely represented among the various European strains, and which is mostly due to the crossing of the two original stocks.

Both these breeds were brought under the dominion of man in a very remote age, and have varied in exact proportion to the care taken in selecting the various characters. Both are found in the pile-

dwellings in the Swiss Lakes which belong to the Neolithic age, or to that period when the use of metal was unknown in Europe north of the Alps, and both were probably introduced from the East by the same race of herdsmen to whom we owe the domestic cattle, Horses, and Dogs, as well as the arts of gardening, farming, and spinning. The amount of change which has been produced by the art of man in modifying the original stock may be estimated from the figure at the top of the preceding page.

THE SOLID-HOOFED BREED OF PIGS.—Among the most remarkable breeds of Pigs under domestication, the Solid-hoofed Pigs deserve special notice, because they show a persistent variation from the even-toed type. "From the time of Aristotle," writes Mr. Darwin, "to the present time, solid-hoofed Swine have been occasionally observed in various parts of the world. Although this peculiarity is strongly inherited, it is hardly probable that all the animals with solid hoofs have descended from the same parents; it is more probable that the same peculiarity has reappeared at various times and places. Dr. Struthers has lately described and figured the structure of the feet; in both front and hind feet the distal phalanges of the two greater toes are represented by a single, great, hoof-bearing phalanx; and in the front feet, the middle phalanges are represented by a bone which is single towards the lower end, but bears two separate articulations towards the upper end."

BONES OF PIG'S FOOT.

This singular modification is stated by Dr. Coues to be persistent in a Texas breed. So far as the hoof is concerned the animal is perfectly solid-ungulate. It is also perfectly "odd-toed" (or perissodactyle) in the terminal phalanges, which are joined together so as to form one single hoof-supporting bone, *a* of figure. Above this, however, the other two phalanges (*b*, *c*) remain separate, and are widely separated from each other by the intervention of a special ossicle (*d*). How far this departs from the normal type may be seen from the comparison of the figure with that of the foot of the Common Hog.

FOOT OF SOLID-HOOFED PIG. (*After Coues.*)
The hoof, *c*, is withdrawn sufficiently to show the joints.

Among the aberrant forms resulting from domestication, according to Nathusius, is the JAPAN, OR MASKED PIG (*S. plicieeps*, Gray), with its short head, broad forehead and nose, great fleshy ears, and deeply-furrowed skin, of which the great thick folds are compared by Mr. Darwin to the plates on the Indian Rhinoceros. It is held by Nathusius to belong to the same stock as the Chinese Pig, a view which is by no means improbable if we consider the enormous differences which are produced by the selection of characters under the care of man in the European breeds.

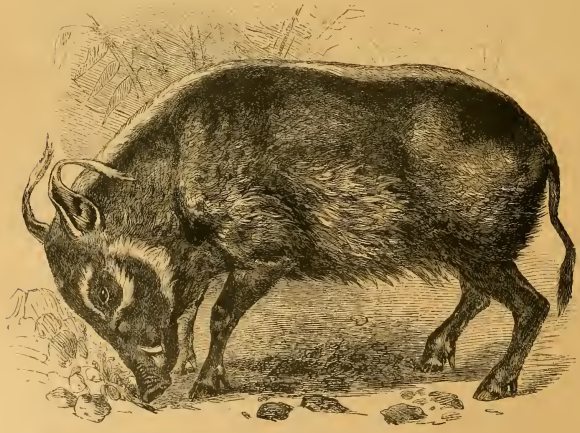
The Hogs are represented in Africa, south of the Sahara, and in Madagascar, by an animal known as the BUSH HOG (*Potamochœrus*), which possesses a remarkable boss or excrescence, rising from the face below the eyes. The species figured, the *Potamochœrus penicillatus*, has peculiar ears which look almost as if they had been cut.

One of the most singular of the Wild Hogs is the BABIRUSA (*Porcus babirusa*), inhabiting the islands of Celebes and Borneo, in which, in the males, the tusks arrive at an enormous size, those of the upper jaw curving upwards and backwards, and even, in some cases, penetrating the skull in their backward reach. These tusks, however, are useless for purposes of attack. The lower jaws also are armed with two sharp tusks, which are capable of inflicting severe wounds. The animal is nearly hairless, and is said to arrive at a size not much less than that of a Donkey. It is very ferocious, and is a more formidable antagonist than the Wild Boar of Europe.

The name *Babirusa* is said to be a compound of *Baba* and *Rusa*, being the Malayan appellations of the Pig and the Deer respectively.

The Babirusa is described as being of a delicate nature, requiring considerable care and attention when kept in confinement. In its natural state it is said to be very swift, running with the rapidity

MASKED PIG.



BUSH HOG.

of a Deer, and to be of a fierce disposition. The flesh of this animal is highly prized as an article of food in the countries in which it is found.

The Wart Hogs (*Phacochœrus*) constitute the second well-marked group to be considered under the head of the family of Hogs. They range over tropical Africa from Abyssinia to Caffraria. They are remarkable, not only for having enormous tusks, and for the development of a large excrescence, or wart, under each eye, but also for the peculiar construction of their last grinding teeth. These are

BABIRUSA.

massive, and composed of prisms of enamel surrounding a central mass of dentine, and embedded in the cement which unites them into one tooth. There is only one pair of upper incisors, and the last molars are the only ones which are not shed in the old animal. The canines are large, recurved, sharp, and project eight or nine inches beyond the lips.

Two species of this peculiar genus occur in Africa. Ælian's Wart Hog* is a native of the North of Africa. Its skin is of a reddish colour, sparingly supplied with bristles; the neck and back support a mane, some of the bristles of which attain a considerable length.

The Ethiopian Wart Hog (*P. æthiopicus*) is a native of the southern portions of Africa, and differs principally from the preceding in the larger size of the warts, and a more peculiarly shaped head. The food of both species of Wart Hogs appears to consist almost entirely of roots.

* *Phacochœrus Ælianus.*

The Hog family is represented in the New World by the small though formidable animals known as the PECCARIES (*Dicotyles*), which are not more than about three feet long, and about fifty or sixty pounds in weight. They live in herds, are omnivorous, and are perhaps the most awkward animals to be dealt with by the hunter in the forests of South America. They know no fear, and will attack anything which comes in their way, inflicting frightful wounds with their short, lancet-shaped tusks, which are entirely concealed within their lips. They live in holes and hollow logs, into which they back, one by one, until their abode is full, the last standing as sentinel with his head outside. This habit affords the hunter an easy means of killing them, for if the sentinel be killed outright the next takes his place, after pushing out the dead body, and this may go on until the last of the herd is killed.

SKULL OF THE ETHIOPIAN WART HOG.

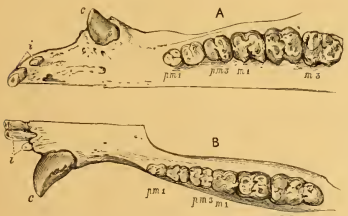
The dentition of the Peccary differs from that of the True Hogs in the smaller number of teeth, which are thirty-eight, instead of forty-four, in number, the upper incisors being reduced to four, and the premolars in the upper and lower jaws being six instead of eight. There are also differences in

ETHIOPIAN WART HOG.

PECCARY.

the shape of the teeth, the grinders presenting transverse ridges, as may be seen from the comparison of the accompanying figure with that of the Hog.

There is also another important difference to be noted between the Peccaries and the True Hogs in the structure of the feet. In the former, the middle metatarsals and metacarpals unite into a solid cannon bone analogous to that of cattle, while in the latter they are distinct during the whole life of the animal.



DENTITION OF PECCARY. (A, Upper; B, Lower jaw.)

Two species of Peccary are known, the COMMON, OR TAJUCA, OR COLLARED PECCARY (*Dicotyles torquatus*), which ranges from Texas as far as the Straits of Magellan, and the WHITE-LIPPED PECCARY (*D. labiatus*), of the forests of South America. The latter is the larger of the two, and the more ferocious.

THE FOSSIL HOGS.—The remains of the Fossil Hog are met with in the fossil state in Europe, as far back as the Miocene Age, in which period, as Professor Gaudry has pointed out, the canines were not developed into large tusks in the Hog tribe. In the Pliocene Age the males possessed moderate tusks, and in the Pleistocene, as at the present time, the forests of Europe were haunted by large "tuskers."

HIPPOPOTAMI IN A MEADOW BY THE SENEGAL.

CHAPTER IV.

ARTIODACTYLA—THE HIPPOPOTAMUS FAMILY.

Present Representatives—Two Species—THE COMMON RIVER HORSE—General Appearance—Characteristics: Skin, Head, Nostrils, Eyes, Ears, Legs, Tail, Mouth, Tusks, Dentition, Skeleton, Stomach—Habits—Food—Under Water—Behemoth of the Bible—Used in the Roman Sports—As described by the Ancient Naturalists—As portrayed by the Ancient Artists—The First Hippopotamus in England—Subsequent Inmates of the Zoological Gardens—Herds of Hippopotami—Harpoon for Hunting—Sir Samuel Baker's Accounts of Hippopotamus Hunts—Various Methods of Capture—Occasional Fits of Blind Fury—A Night Attack upon a Dhabbeeah—Uses of the Hippopotamus—THE LIBERIAN HIPPOPOTAMUS—Fossil Forms—THE ANOPLOTHERES.

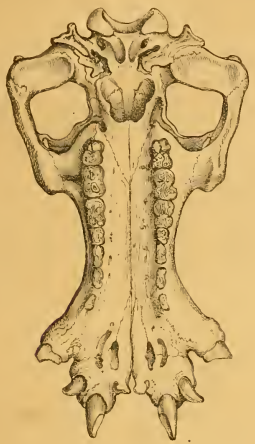
II.—THE HIPPOPOTAMUS FAMILY (HIPPOPOTAMIDÆ).

THE Hippopotami, or River Horses, constitute the second family to be considered next after the Hogs, among the non-ruminant hoofed animals possessing an even number of toes on each foot. They are represented at the present time by two closely-allied species found only in Africa, the *Hippopotamus amphibius*, or Common River Horse, which haunts the rivers of Africa from the Sahara desert to the Cape Colony; and the much smaller Liberian animal, living on the west coast and on the rivers flowing into Lake Tchad.

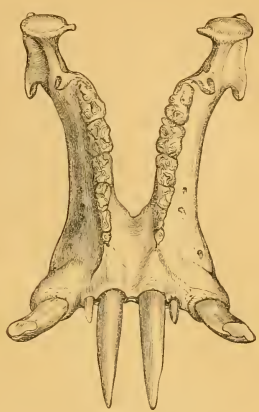
THE COMMON RIVER HORSE (*Hippopotamus amphibius*) is a large, unwieldy-looking animal, sometimes as much as eleven or twelve feet long, with a massive body and enormous head, and short stout legs. Nevertheless, it is capable of moving swiftly on the land and of swimming with perfect ease. Its skin is naked, thick, and penetrated by pores which exude a thick fatty secretion, which may perhaps be useful to it while in the water. The front part of the head is massive, and broader than that of any other living quadruped; the nostrils are comparatively small slits, which are closed and water-tight during the frequent dives beneath the surface of the water; the eyes are prominent, and placed far back in the head; and the ears are so short that they look as if they had been cropped. They, too, have a special arrangement of muscles by which they can be closed. The short legs are terminated by four hoof-bearing toes; and the short tail is adorned with bristles arranged laterally and on opposite sides, which are the only traces of hair found on the animal. The mouth is very large, and armed with tusks and grinders, that present a fearful appearance when the animal opens its mouth with a gape, which is unsurpassed in width by that of any other animal. The tusks are enormous, especially those in the lower jaw, which are curved upwards as in the Hogs, and meet those of the upper jaw close to their sockets. By the attrition of their surfaces together their tips are reduced to a chisel edge. Between these great teeth are four front or incisor teeth, of conical shape, in both upper and lower jaws, those in the latter being the larger. The grinders in each jaw are three in number, and of a trefoil pattern on their worn surfaces; while the false grinders in front of them, four in number in

each jaw, are conical, sharp-edged, and resemble those of the Hogs. The skeleton is very Hog-like, and the stomach is divided into four compartments. The liver has a gall-bladder, and the kidneys are divided into lobes.

The River Horse is nocturnal in its habits, frequenting rivers and lagoons, and rarely leaving them

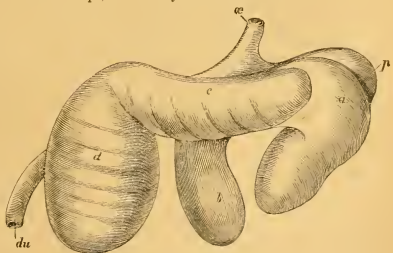


BASE OF SKULL OF HIPPOPOTAMUS, SHOWING DENTITION.



LOWER JAW OF HIPPOPOTAMUS, SHOWING DENTITION.

or their immediate neighbourhood except at night, when it will go considerable distances in search of food, sometimes causing great damage to cultivated crops, which may be estimated from the fact that its stomach is capable of holding from five to six bushels. Its food consists principally of grass, young shrubs, and water plants, and it is particularly fond of green corn. When in the water its slow respiration enables it to remain for a long time beneath the surface without coming up to breathe; and the means of closing both its ears and nostrils against the access of water, before alluded to, is admirably suited for its aquatic habits.



STOMACH OF HIPPOPOTAMUS. (*After Clark.*)
a b c d, the four divisions in their order; *p*, partition in interior of division; *œ*, œsophagus; *du*, duodenum.

The first and only time in which any animal at all answering the description of the Hippopotamus is mentioned in the Bible is under the designation of Behemoth (Job xl. 15—24), and even then there is room for doubt as to whether the description may not be nearly as applicable to the Elephant, though on the whole it certainly suits the Hippopotamus better.

It is interesting to know that Milton evidently considered Behemoth to mean the Elephant, or, at any rate, not the Hippopotamus, for in "Paradise Lost," in writing of the Creation, he says:—

> "Scarce from his mould
> Behemoth, biggest born of earth, upheaved
> His vastness: fleeced the flocks, and bleating, rose
> As plants: ambiguous between sea and land
> The *river horse* and scaly crocodile."

According to Pliny, the Hippopotamus was first seen in Europe in the curule ædileship of Scaurus, 58 B.C., when the exhibition in the circus surpassed anything the Romans had ever seen. Among other novelties, he exhibited a Hippopotamus and five Crocodiles. But according to Dion Cassius, the Hippopotamus was first shown in the games celebrated by Augustus, 29 B.C. So great was the demand for Hippopotami in the Roman sports at a later period, that according to Marcellinus Ammianus, they had disappeared from Egypt since the time of the Emperor Julian. Favourable circumstances, however, must have again restored them, as we learn, from the accounts given by Zerenghi and others, of their being plentiful about the year 1600 and later. In some parts of Egypt the Hippopotamus seems to have been sacred, as we learn from Herodotus. Sonnini relates that the Hippopotami laid bare whole countries by their terrible ravages, and from the terror they inspired they were generally looked upon as the symbol of Typhon, that giant who spread death and destruction among the deities which were worshipped, and were the emblem of mischance and cruelty, and that the worship of them at Papresius was practised with the view of appeasing and averting their anger.

The descriptions given by early writers of the Hippopotamus are in many instances most ludicrous. Aristotle, borrowing from Herodotus, states that "the Hippopotamus of Egypt has a mane like a Horse, a bifurcated hoof like an Ox, a flat visage or muzzle, an astragalus like the animals with cloven feet, projecting teeth which do not show themselves much, the tail of a Hog, the voice of a Horse, and in size it resembles an Ass. Its skin is of such a thickness that spears are made of it." It is pretty clear from this description that Aristotle meant the Hippopotamus, but also that he never saw one. Diodorus approaches nearer to the truth as to the size of this animal when he says that it is five cubits in length, and that the bulk resembles that of the Elephant. However, he still retains the cloven hoof and Horse's mane. Pliny speaks of it as living in the Nile, and also gives it the bifid hoof of the Ox, the back, mane, and neigh of the Horse, a flattened muzzle, the tail and teeth of the Boar; evidently following the descriptions given of it by Aristotle. He also adds that helmets and bucklers are made of its skin, and that the animal feeds on the crops, and is very cautious in avoiding snares; but he goes on to say that it is covered with hair like the Seals. It is difficult to conceive how he could have fallen into so great an error after having spoken of its being exhibited in Rome by M. Scaurus, with five Crocodiles. He finishes his account by stating that when the animal gets too fat, and is diseased, it bleeds itself by pressing a vein of its leg against some sharp object, and then plastering up the wound with mud, so that it may speedily heal. The ancient artists appear to have been more faithful in their portraits of the Hippopotamus than the ancient authors and naturalists in their descriptions; indeed, with very few exceptions, the animal has been pretty faithfully portrayed. One exception is a figure copied by Hamilton from one of the caves of Beni-Hassan, in which the feet are displayed as cloven, and the lower tusks made to appear so excessively large as to prevent all possibility of their being hidden when the animal closed its jaws. In the figure on the plinth of the statue of the Nile, which was formerly in the Vatican, although the teeth and feet are not correct, the general idea is good; and in many other sculptures and mosaics it is very well represented, also on some of the medals and coins of Roman Emperors: sometimes it is represented as holding a Crocodile in its mouth, which probably may have given rise to the stories of the enmity the Hippopotamus bears towards the Crocodile. In more modern times we have more or less fabulous descriptions given by Isidore of Seville and Vincent de Beauvais, neither of whom appears to have seen the animal. Belon and Gillius, it would seem, are the first of the moderns who actually saw the Hippopotamus alive, and this was at Constantinople, although Sonnini appears to doubt the identity of the animal which Belon saw. This is hardly justifiable, as Belon was a very accurate

observer, and even points out with much truth the differences between the one he saw and those he had seen pictured on ancient works of art.

The first Hippopotamus ever seen alive in Great Britain, or indeed in Europe in modern times, was brought to England on the 25th of May, 1850, and placed in the Gardens of the Zoological Society. Mitchell gives the following account of its capture and habits:—"Since the Imperial Exhibitions in the Circus of Rome, no living Hippopotamus has been imported into Europe, except the young male which the Society possesses. The difficulty of obtaining such an animal may be conjectured from the fact that after the Viceroy of Egypt had determined to present one to the Society, it became necessary for his Highness to despatch an expedition to the Upper Nile for the purpose of making the capture, and that success was only achieved after two thousand miles of the river had been ascended. In the month of July, 1849, the chief huntsman of the party, in searching the reedy margin of an island in the White Nile, called Obaysch, at last discovered a little Hippopotamus calf, which, as he conjectured, had been born about two days. It was so small that, in his delight at having accomplished the Pasha's order, he seized it in his arms, and would have carried it to the boat which waited on him, had not the slimy exudation which is lavishly poured forth from innumerable pores in the skin of the young Hippopotamus rendered it so slippery that he was entirely unable to retain his hold. The animal having thus slipped from his grasp, all but escaped into the Nile, where the mother doubtless was lying near at hand. The hunter, however, with the presence of mind which characterises a good sportsman, seized his spear, and with the sharp side-hook, which has been in fashion in Egypt for three thousand years or more, he succeeded in arresting the headlong plunge of his prize, without inflicting greater injury upon him than a skin wound, the scar of which he bore to the day of his death. The long voyage down the river was successfully accomplished in a boat which had been built for the purpose by the Viceroy's order, and 'Obaysch,' as they named the Hippopotamus, from his birthplace, was safely delivered in November, 1849, after a journey of four months, into the care of the Hon. C. A. Murray, through whose powerful influence the Viceroy had been prevailed upon to exert his power and assist the Society in an object for which all exertions of their own had failed. Obaysch spent his first winter in Cairo, under the charge of his intelligent keeper, Hamet Saaffi Canaana, a Nubian Arab, whom Mr. Murray engaged for the purpose. In May, 1850, proper preparations were made, with the obliging co-operation of the directors, in the Peninsular and Oriental Steam Navigation Company's ship *Ripon*, for the transport from Alexandria, and on the 25th of that month the first Hippopotamus which had breathed on English soil within this period of history was landed successfully on the quay at Southampton, and liberated in the Gardens from his travelling-house at ten o'clock the same evening. On emerging from the door of it he followed Hamet, who had scarcely ever left him during the whole voyage from Cairo, into the building which had been prepared for him, and instantly indulged in a long-continued bath. The ten hours which elapsed between his removal from the steamer at Southampton, and his arrival in the Regent's Park, is the longest period during which he has ever been without access to water."

For the first year Obaysch was fed almost entirely on Cow's milk and finely-ground Indian corn, and as he grew older he consumed about 100 lbs. weight of hay, chaff, corn, roots, and green food a day. He rapidly grew, until he reached the enormous weight of about four tons, and he was one of the chief attractions of the Gardens at the time of his death in March, 1858.

In 1853 a young female, Adhela, was obtained from the same district, and in the spring of 1871 the first calf was born, and a second in January, 1872, both of which were lost shortly after their birth, in spite of every care and precaution. The third was born on the 5th of November, 1872, and called "Guy Fawkes," and has been successfully reared. Little Guy Fawkes sucked freely shortly after its birth, and has continued to thrive up to the present time, now rivalling her mother in size. When she chooses to disport herself in her huge tank, her vast bulk and enormous gape combine to keep the crowd of onlookers in a proper state of subjection not unmixed with awe.

Hippopotami roam together in herds, and where they have not been disturbed come fearlessly to the top of the water, often lazily basking on the surface, and on the banks; but in places where they have been hunted and shot at they become very wary, and content themselves by just showing

their noses among weeds, and sometimes they are so carefully concealed that but for their footprints on the bank of the river their presence would be unsuspected. Cumming, in his African hunting experiences, gives a description of seeing an entire colony of these animals on the banks of the Limpopo. He says :—"Presently in a broad and deeply shaded pool of the river we heard the Sea Cows bellowing, and on approaching somewhat nearer beheld a wonderful and interesting sight. On a sandy

COMMON HIPPOPOTAMUS.

promontory of the island stood about thirty cows and calves, whilst in the pool opposite and a little below them stood about twenty more Sea Cows, with their heads and backs above water. About fifty yards farther down the river, again showing out their heads, were eight or ten immense fellows, which I think were all bulls, and about a hundred yards below these, in the middle of the stream, stood another herd of eight or ten cows with calves, and two large bulls. The Sea Cows lay close together like Pigs, and as they sprawl in the mire have not the least objection to their neighbours pillowing their heads on their backs and sides."

Livingstone also gives a description of seeing a herd of Hippopotami as follows :—"On a shallow sand bank, under a dyke crossing the River Zambesi near the mouth of the Sinjere, lay a

HIPPOPOTAMUS.

(*From the Living Specimen in the Zoological Gardens, London.*)

herd of Hippopotami in fancied security. The young ones were playing with each other like young puppies, climbing on the backs of their dams, trying to take hold of one another by the jaws, and tumbling over into the water. Mbia, one of the Makotols, waded across to within a dozen yards of the drowsy beasts, and shot the father of the herd, who being very fat soon floated, and was secured at the village below. The men then gorged themselves with meat for two days, and cut large quantities into long narrow strips, which they half dried and half roasted on wooden frames over the fire."

The harpoon is the weapon usually used by the natives of Africa for catching the Hippopotamus. One kind of harpoon consists of a shaft about twelve feet long, at one end of which is a combination of spear and fish-hook, the spear being let into a socket of the shaft, and also

HUNTING HIPPOPOTAMI WITH THE HARPOON.

attached to the shaft by means of cords. At the other extremity is a coil of rope, to which is attached a large float, so that when a Hippopotamus is harpooned the float shows the position of the animal. When an animal is struck, it is followed either by men in canoes or on land, who by means of ropes get possession of the line to which the float is attached, which they entwine round a tree, and every time the animal comes up to breathe he is greeted with a shower of spears until finally finished.

Livingstone in his "African Travels" gives the following interesting account of this instrument and its makers. He relates that on the Zambesi River "beyond Pita lies the little island Nyamotobsi, where we met a small fugitive tribe of Hippopotamus hunters, who had been driven by war from their own island in front. With the civility so common among them, the chief ordered a mat to be spread for us under a shed, and then showed us the weapon with which they kill the Hippopotamus. It is a short iron harpoon inserted in the end of a long pole, but being intended to unship, it is made fast to a strong cord of milola, or hibiscus bark, which is wound closely round the entire length of the shaft, and secured at its opposite end. Two men in a swift canoe steal

quietly down on the sleeping animal. The bowman dashes the harpoon into the unconscious victim, while the quick steersman sweeps the light craft back with his broad paddle. The force of the blow separates the harpoon from its corded handle, which, appearing on the surface, sometimes with an inflated bladder attached, guides the hunters to where the wounded beast hides below until they despatch it." Livingstone then goes on to say:—"These Hippopotamus hunters form a separate people called Akombwi, or Mapodzo, and rarely—the women, it is said, never—intermarry with any other tribe. The reason for their keeping aloof from certain of the natives of the Zambesi is obvious enough, some having as great an abhorrence of Hippopotamus meat as Mohammedans have of swine's flesh. Our pilot, Scissors, was one of this class; he would not even cook his food in a pot which had contained Hippopotamus meat, preferring to go hungry until he could find another, and yet he traded eagerly in the animals' tusks, and ate with great relish the flesh of the foul-feeding Marabout."

Sir Samuel Baker relates from personal observation the capture of a Hippopotamus with the harpoon above described. He says:—"At length we arrived at a large pool, in which were several sand-banks covered with rushes, and many rocky islands. Among these rocks was a herd of Hippopotami, consisting of an old bull and several cows; a young Hippo was standing, like an ugly little statue, on a protruding rock, while another infant stood upon its mother's back that listlessly floated on the water. This was an admirable place for the hunters. They desired me to lie down, and they crept into the jungle out of view of the river. I presently observed them stealthily descending the dry bed about two hundred paces above the spot where the Hippos were basking behind the rocks. They entered the river, and swam down the centre of the stream towards the rock. This was highly exciting. The Hippos were quite unconscious of the approaching danger, as steadily and rapidly the hunters floated down the strong current; they neared the rock, and both heads disappeared as they purposely sank out of view; in a few seconds later they reappeared at the edge of the rock upon which the young Hippo stood. It would be difficult to say which started first, the astonished young Hippo into the water, or the harpoons from the hands of the howartis! It was the affair of a moment. The hunters dived directly they had hurled their harpoons, and swimming for some distance under water, they came to the surface, and hastened to the shore lest an infuriated Hippopotamus should follow them. One harpoon had missed; the other had fixed the bull of the herd, at which it had been surely aimed.

"This was grand sport! The bull was in the greatest fury, and rose to the surface, snorting and blowing in his impotent rage; but as the ambatch float was exceedingly large, and this naturally accompanied his movements, he tried to escape from his imaginary persecutor, and dived constantly, only to find his pertinacious attendant close to him upon regaining the surface. This was not to last long. The howartis were in earnest, and they at once called their party, who, with two of the aggageers, Abou Do and Suleiman, were near at hand. These men arrived with long ropes that form a portion of the outfit for Hippo hunting. The whole party now halted on the edge of the river, while two men swam across with one end of the long rope. Upon gaining the opposite bank, I observed that a second rope was made fast to the middle of the main line; thus upon our side we held the ends of two ropes, while on the opposite side they had only one. Accordingly, the point of junction of the two ropes in the centre formed an acute angle. The object of this was soon practically explained. Two men upon our side now each held a rope, and one of these walked about ten yards before the other. Upon both sides of the river the people now advanced, dragging the rope on the surface of the water until they reached the ambatch float that was swimming to and fro, according to the movements of the Hippopotamus below. By a dexterous jerk of the main line the float was now placed between the two ropes, and it was immediately secured in the acute angle by bringing together the ends of these ropes on our side. The men on the opposite bank now dropped their line, and our men now hauled in upon the ambatch float that was held fast between the ropes. Thus cleverly made sure, we quickly brought a strain upon the Hippo; and although I have had some experience in handling big fish, I never knew one pull so lustily as the amphibious animal that we now alternately coaxed and bullied.

"He sprang out of the water, gnashed his huge jaws, snorted with tremendous rage, and lashed the river into foam; he then dived, and foolishly approached us beneath the water. We quickly gathered in the slack line, and took a round turn upon a large rock within a few feet of the river.

"The Hippo now rose to the surface about ten yards from the hunters, and jumping half out of the water, he snapped his great jaws together, endeavouring to catch the rope, but at the same instant two harpoons were launched into his side.

"Disdaining retreat, and maddened with rage, the furious animal charged from the depths of the river, and gaining a footing, he reared his bulky form from the surface, came boldly upon the sand-bank, and attacked the hunters open-mouthed. He little knew his enemy: they were not the men to fear a pair of gaping jaws, armed with a deadly array of tusks, but half a dozen lances were hurled at him, some entering his mouth from a distance of five or six paces; at the same time several men threw handfuls of sand into his enormous eyes. This baffled him more than the lances: he crunched the shafts between his powerful jaws like straws, but he was beaten by the sand, and, shaking his huge head, he retreated to the river. During his sally upon the shore, two of the hunters had secured the ropes of the harpoons that had been fastened in his body just before his charge. He was now fixed by three of these deadly instruments; but suddenly one rope gave way, having been bitten through by the enraged beast, who was still beneath the water. Immediately after this he appeared on the surface, and without a moment's hesitation, he once more charged furiously from the water straight at the hunters, with his huge mouth open to such an extent that he could have accommodated two inside passengers. Suleiman was wild with delight, and springing forward lance in hand, he drove it against the head of the formidable animal, but without effect. At the same time, Abou Do met the Hippo sword in hand, reminding me of Perseus slaying the sea-monster that would devour Andromeda; but the sword made a harmless gash, and the lance, already blunted against the rocks, refused to penetrate the tough hide. Once more handfuls of sand were pelted upon his face, and again repulsed by this blinding attack, he was forced to retire to his deep hole, and wash it from his eyes. Six times during the fight the valiant bull Hippo quitted his watery fortress, and charged resolutely at his pursuers; he had broken several of their lances in his jaws; other lances had been hurled, and falling upon the rocks, they were blunted and would not penetrate. The fight had continued for three hours, and the sun was about to set; accordingly the hunters begged me to give him the *coup de grâce*, as they had hauled him close to the shore, and they feared he would sever the rope with his teeth. I waited for a good opportunity, when he boldly raised his head from the water about three yards from the rifle, and a bullet from the little Fletcher between the eyes closed the last act."

Another interesting account is also given by Sir S. Baker of the capture of a Hippopotamus by means of the spear. The description conveys a good idea of the habits and wariness of these animals.

"Hippopotami had trodden a path along the margin of the river, as these animals came out to feed, shortly after dark, and travelled from pool to pool. Wherever a plot of tangled and succulent herbage grew among the shady nabbuks, there were the marks of the harrow-like teeth, that had torn and rooted up the rank grass like an agricultural implement.

"After walking about two miles, we noticed a herd of Hippopotami, in a pool below a rapid, where the rush of water had thrown up a bank of pebbles and sand. Our old Neptune did not condescend to bestow the slightest attention when I pointed out these animals—they were too wide awake; but he immediately quitted the river's bed, and we followed him quietly behind the fringe of bushes upon the border, from which we carefully examined the water.

"About half a mile below this spot, as we clambered over the intervening rocks through a gorge which formed a powerful rapid, I observed, in a small pool just below the rapid, an immense head of a Hippopotamus close to a perpendicular rock that formed a wall to the river, about six feet above the surface. I pointed out the Hippo to old Abou Do, who had not seen it. At once the gravity of the old Arab disappeared, and the energy of the hunter was exhibited as he motioned us to remain, while he ran nimbly behind the thick screen of bushes for about a hundred and fifty yards below the spot where the Hippo was unconsciously basking, with his ugly head above the surface. Plunging into the rapid torrent, the veteran hunter was carried some distance down the stream, but breasting the powerful current, he landed upon the rocks on the opposite side, and retiring some distance from the river, he quickly advanced towards the spot beneath which the Hippopotamus was lying. I had a fine view of the scene as I was lying concealed exactly opposite the Hippo, who had disappeared beneath the water. Abou Do now stealthily approached

the ledge of rock beneath which he had expected to see the head of the animal; his long sinewy arm was raised, with the harpoon ready to strike, as he carefully advanced. At length he reached the edge of the perpendicular rock. The Hippo had vanished, but far from exhibiting surprise, the old Arab remained standing on the sharp ledge, unchanged in attitude. No figure of bronze could have been more rigid than that of the old river king, as he stood erect upon the rock, with the left foot advanced, and the harpoon poised in his ready right hand, above his head, while in the left he held the loose coils of rope attached to the ambatch buoy. For about three minutes he stood like a statue, gazing intently into the clear and deep water beneath his feet. I watched eagerly for the reappearance of the Hippo. The surface of the water was still barren, when suddenly the right arm of the statue descended like lightning, and the harpoon shot perpendicularly

HIPPOPOTAMI AT THE FALLS OF THE RIVER SENEGAL.

into the pool with the speed of an arrow. What water fiend answered to the summons? In an instant an enormous pair of open jaws appeared, followed by the ungainly head and form of the furious Hippopotamus, who, springing half out of the water, lashed the river into foam, and, disdaining the concealment of the deep pool, he charged straight up the violent rapids. With extraordinary power he breasted the descending stream; gaining a footing in the rapids, about five feet deep, he ploughed his way against the broken waves, sending them in showers of spray upon all sides, and upon gaining broader shallows he tore along through the water, with the buoyant float hopping behind him along the surface, until he landed from the river, started at full gallop along the dry shingly bed, and at length disappeared in the thorny nabbuk jungle.

"I never could have imagined that so unwieldy an animal could have exhibited such speed; no man would have had a chance of escape, and it was fortunate for our old Neptune that he was secure upon the high ledge of rock, for if he had been in the path of the infuriated beast, there would have been an end of Abou Do.

"The old man plunged into the deep pool just quitted by the Hippo, and landed upon our

side, while in the enthusiasm of the moment I waved my cap above my head, and gave him a British cheer as he reached the shore. His usually stern features relaxed into a grim smile of delight; this was one of the moments when the gratified pride of the hunter rewards him for any risks. I congratulated him on his dexterity; but much remained to be done. I proposed to cross the river, and to follow upon the tracks of the Hippopotamus, as I imagined that the buoy and rope would catch in the thick jungle, and that we should find him entangled in the bush; but the old hunter gently laid his hand upon my arm, and pointed up the bed of the river, explaining that the Hippo would certainly return to the water after a short interval.

"In a few minutes later, at the distance of nearly half a mile, we observed the Hippo emerge from the jungle, and descend at full trot to the bed of the river, making direct for the first rocky pool, in which we had noticed the herd of Hippopotami. Accompanied by the old howarti (Hippo hunter), we walked quickly towards the spot; he explained to me that I must shoot the harpooned Hippo, as we should not be able to secure him in the usual method by ropes, as nearly all our men were absent from camp, disposing of the dead Elephants. Upon reaching the pool, which was about a hundred and thirty yards in diameter, we were immediately greeted by the Hippo, who snorted and roared as we approached, but quickly dived, and the buoyant float ran along the surface, directing his course in the same manner as the cork of a trimmer with a pike upon the hook. Several times he appeared, but as he invariably faced us, I could not obtain a favourable shot; I therefore sent the old hunter round the pool, and he, swimming the river, advanced to the opposite side, and attracted the attention of the Hippo, who immediately turned towards him. This afforded me a good chance, and I fired a steady shot behind the ear, at about seventy yards, with a single-barrelled rifle. He disappeared beneath the water at the shot. The crack of the ball and the absence of any splash from the bullet told me that he was hit; the ambatch float remained perfectly stationary upon the surface. I watched it for some minutes; it never moved. Several heads of Hippopotami appeared and vanished in different directions, but the float was still; it marked the spot where the grand old bull lay dead beneath."

In addition to the ordinary means of harpooning, a harpoon is also used as a sort of trap, it being well known to the hunters that the Hippopotamus has certain roads or tracks which it habitually uses, preferring a quiet gully with tall trees and grass overhanging. The hunter finding such a road prepares a harpoon within six feet of a moderate-sized tree-trunk, to which he attaches heavy stones. Having found a suitable tree overhanging the path of the Hippopotamus, he throws the rope which is attached to the shaft of the harpoon round a branch, and hauls up his weighted instrument, having done which he drives a stake on one side of the path and turns the rope round it. He then drives another stake on the other side of the path, stretches his rope across, and fastens it to the other stake. The unsuspecting animal, taking his usual evening stroll, strikes his foot against the rope, which dislodging the stakes, the harpoon comes thundering down and the Hippopotamus is transfixed, to be found in the morning by the trapper, probably dead or dying, a long way from the scene of the trap.

Livingstone gives an account in his "African Travels" of a Hippopotamus captured by means of this trap, of whose working he was himself an eye-witness. He says that "both banks of the River Zambesi near the Mboma village are dotted with Hippopotamus traps, over every track which these animals have made in going up out of the water to graze. The Hippopotamus feeds on grass alone, and where there is any danger only at night. Its enormous lips act like a mowing-machine, and form a path of short-cropped grass as it feeds. We never saw it eat aquatic plants or reeds. The tusks seem weapons of both offence and defence. The Hippopotamus trap consists of a beam five or six feet long, armed with a spear-head, or hard-wood spike covered with poison, and suspended to a forked pole by a cord, which, coming down to the path, is held by a catch, to be set free when the beast treads on it. Being wary brutes, they are still very numerous. One got frightened by the ship as she was steaming close to the bank. In its eager hurry to escape it rushed on shore, and ran directly under a trap, when down came the heavy beam on its back, driving the poisoned spear-head a foot deep into its flesh. In its agony it plunged back into the river, to die in a few hours, and afterwards furnish a feast for the natives. The poison on the spear-head does not affect the meat, except the part around the wound, and that is thrown away. In some places the descending beam is weighted with heavy stones, but here the hard heavy wood is sufficient."

The Hippopotamus is also captured by means of pitfalls placed in the animal's tracks. The mouth of the pit is carefully concealed by means of boughs of trees, grass, rushes, &c. Usually two and sometimes three of these pits are dug in close proximity to each other, the extreme wariness of the Hippopotamus causing it to be suspicious of danger, and whilst carefully avoiding one trap it falls into another.

Sometimes these pits catch a very different kind of animal from that for which they were intended. A good story is told in a book of African travels of a Frenchman who had the misfortune to fall into one, and after spending the whole of the morning in getting out, whilst congratulating himself on his success, and brushing off the mud, he tumbled into another close by, from which he did not escape until late in the evening.

The Hippopotamus has been considered by travellers and naturalists to be of a mild and inoffensive disposition, retiring and shy in its habits, and unless provoked rarely attacking man. Probably this to a great extent is true of the animal, but numerous instances are recorded of most ferocious and quite unprovoked attacks, and when this is the case few animals are capable of showing such blind rage.

Canoes are sometimes overturned and crunched between the jaws of this powerful animal without any apparent reason, and even on dry land it occasionally attacks man. Sir S. Baker relates an account of a bull Hippopotamus attacking the proprietor of a melon-garden, and killing him by one crunch of his huge jaws; and Dr. Moffat, the father-in-law of Livingstone, speaks of a man being literally bitten in half by one which chased him on dry land. The Hippopotamus does not seem at all particular as to the size or nature of the objects it assaults, several instances having been recorded of its charging steamers. Sir S. Baker gives the following account of one of these onslaughts on the *Bahir Giraffe*:—"At one p.m., as we were steaming easily, I happened to be asleep on the poop-deck, when I was awakened by a shock, succeeded by the cry, 'The ship's sinking!' A Hippopotamus had charged the steamer from the bottom, and had smashed several floats off her starboard paddle. A few seconds later he charged our diahbeeah, and striking her bottom about ten feet from the bow, he cut two holes through the iron plates with his tusks. On examination two clean holes were found punched through the iron as though driven by a sharp pickaxe."

Another attack of this kind is also related by Sir S. Baker in a lake communicating with the White Nile, which for ferocity and pertinacity is probably unequalled. He says:—"The night was cold, and the moon clear and bright. Every one was wrapped up in warm blankets, and I was so sound asleep that I cannot describe more, until I was suddenly awoke by a tremendous splashing quite close to the diahbeeah, accompanied by the hoarse wild snorting of a furious Hippopotamus. I jumped up, and immediately perceived a Hippo, which was apparently about to attack the vessel. The main deck being crowded with people sleeping beneath their thick Mosquito-curtains, attached to the stairs of the poop-deck, and to the rigging in all directions, rendered it impossible to descend. I at once tore away some of the ties, and awakened the sleeping people. My servant, Suleiman, was sleeping next to the cabin door. I called to him for a rifle. Before the affrighted Suleiman could bring the rifle the Hippopotamus dashed at us with indescribable fury. With one blow he capsized and sank the zinc boat with its cargo of flesh. In another instant he seized the dingy in his immense jaws, and the crash of splintered wood betokened the complete destruction of my favourite boat. By this time Suleiman appeared from the cabin with an unloaded gun in his hand, and without ammunition. This was a very good man, but he was never overburdened with presence of mind; he was shaking so fearfully with nervousness, that his senses had entirely forsaken him. All the people were shouting and endeavouring to scare the Hippo, which attacked us without ceasing, with a blind fury that I have never witnessed in any animal except a Bulldog.

"By this time I had procured a rifle from the cabin, where they were always kept fixed in a row, loaded and ready for action, with bags of breech-loading ammunition on the same shelf. The movements of the animal were so rapid, as he charged and plunged alternately beneath the water in a cloud of foam and wave, that it was impossible to aim correctly at the small but fatal spot upon the head.

"The moon was extremely bright, and presently, as he charged straight at the diahbeeah, I stopped him with a No. 8 Reilly shell. To my surprise, he soon recovered, and again commenced the attack. I fired shot after shot at him without apparent effect.

"The diahbeeah rocked upon the waves raised by the efforts of so large an animal; this movement rendered the aim uncertain. At length, apparently badly wounded, he retired to the high grass; there he lay by the bank, at about twenty-five yards' distance, snorting and blowing. I could not distinguish him, as merely the head was above water, and this was concealed by the deep shadow thrown by the high grass. Thinking he would die, I went to bed; but before this, I took the precaution to arrange a white paper sight upon the muzzle of my rifle, without which night shooting is very uncertain. We had fallen asleep; but in about half an hour we were awoke by another tremendous splash, and once more this huge beast came charging directly at us as though unhurt. In another instant he was at the diahbeeah; but I met him with a ball in the top of his head which sent him rolling over and over, sometimes on his back, kicking with his four legs above the surface, and again producing waves which rocked the diahbeeah. In this helpless manner he rolled for about fifty yards down the stream, and we all thought him killed.

"To our amazement he recovered, and we heard him splashing as he moved slowly along the river through the high grass by the left bank. Ultimately he was killed, and on making a *post-mortem* the following morning, I found he had received three shots in the flank and shoulder, four in the head, one of which had broken his lower jaw, and another had passed through his nose, and passing downward, had cut off one of his large tusks."

The uses to which the Hippopotamus can be applied cannot be considered as many; certainly the flesh is much eaten by the natives of Africa, and even by Europeans it is not to be despised, although travellers seem to disagree as to its merits. Cumming says the flesh is excellent eating, and Baker appears to agree with him, while Dr. Livingstone speaks of it as being pretty good food when one is hungry and can get nothing better, and that it is a coarse-grained meat, having something of the flavour between pork and beef. Probably the Hippopotamus is of considerable use in clearing the rivers of huge water-plants, which abound in African rivers, and which might otherwise in time so choke them up as to convert them from running streams to little else than swamps.

The whips made of Hippopotamus hide are in much request, and are highly esteemed in the neighbouring countries for their elasticity and durability; but the parts of the Hippopotamus most in request, especially by dentists, are the canine teeth, no other ivory keeping its colour so well.

THE LIBERIAN HIPPOPOTAMUS.—The second living species of Hippopotamus (*H. liberiensis*) is a much smaller animal than the common Hippopotamus; according to Dr. Morton, not being larger than a middle-sized heifer, though possessing the relative proportions of the common species. It rarely attains a weight exceeding four hundred pounds, or a quarter of a ton, as distinguished from the four tons' weight of Obaysch of whom we have already spoken. One of the more important differences between them consists in the fact that the Liberian Hippopotamus possesses only two incisors in the lower jaw. A young animal belonging to this species was brought over to Great Britain in 1873, and is stated by Dr. Sclater to have been obtained on the West Coast, from the little Scarcies River. Unfortunately it died shortly after its arrival at the Zoological Gardens in Dublin.

The Hippopotamus ranged in the later Tertiary period far beyond its present home in the African rivers. In the Pliocene age it was very abundant in Italy, and has been met with as far north as Norfolk and Suffolk. In the succeeding, or Pleistocene age, also, it haunted the rivers of France and of England, having been found from the valley of the Ribble northwards. Its remains are from time to time dredged up from the bottom of the German Ocean, and are met with in the dens of Hyænas, as, for example, at Kirkdale, under conditions which prove that it fell a prey to the wild beasts then inhabiting the country. Strange to say, remains of this animal, now flourishing only under a tropical climate, are met with side by side with the remains of the Reindeer, which now flourishes only in a cold temperature, under circumstances which compel us to believe that both animals were living in the same region at approximately the same time. This singular fact can only be accounted for on the supposition that in those days the summer heat was great, and the winter cold severe, such as we find to be the case in Central Asia. These climatic extremes would allow of the same district being inhabited by these animals at different seasons of the year.

An extinct species of Hippopotamus (*Hexaprotodon*), which is characterised by the posses

sion of six instead of four incisors in the upper and lower jaws, lived also in India in the later Tertiary age.

We have seen that at the present time Africa is inhabited by two kinds of Hippopotami, respectively of large and small size. We have also seen that in the Pleistocene age the larger animal inhabited Europe. It is a singular fact that abundant remains of a smaller fossil species, or Pentland's Hippopotamus, should abound in the bone caves of Sicily, and that this dwarfed species should range from that island to Malta, Crete, and the Morea. It is closely allied to the Liberian species, although it is pretty clear that it differed from it in certain details, such as in the form of its molar teeth. A small species of Hippopotamus has been found fossil in Madagascar.

ANOPLOTHERE RESTORED.

THE ANOPLOTHERES (ANOPLOTHERIDÆ).

Certain extinct animals living in the Eocene times, included by Cuvier in his division of the Pachyderms, and closely allied to the Hogs and Hippopotami, constitute the family of Anoplotheres. They were first revealed by the genius of Cuvier from the study of the remains discovered in the gypsum quarries at Montmartre; and they owe their name and their most distinguishing character to the fact that their teeth, which in all number forty-four, form an even, unbroken series, like those in man, the canines not standing out sharp and prominent above the rest, as in the case of the Carnivores and the Palæotheres found in association with them. These animals presented remarkable variations in size, some being as large as a Pony, while others were about the size of a Gazelle. They varied also in their proportions, some being heavily built, as in the restoration given above, while others were slender and elegant like the Antelopes. They are of peculiar interest, because they are the parent stock from which in succeeding geological ages the Ruminants are derived.

W. Boyd Dawkins.
H. W. Oakley.

A Classified Catalogue
OF
CASSELL & COMPANY'S PUBLICATIONS.

1d. **Cassell's Penny Illustrated Stories.** Consisting of a Series of 52 New and Original Stories by Popular Authors. Fully Illustrated. *(List sent free on application).*

Historical Cartoons, Descriptive Account of.

Cassell's New Poetry Readers. Illustrated. 12 Books. Each. 1.vo and 2.vo, 2d.

The Scandinavian Plan. A Sermon on Temperance, by the Very. J. M. Wilson, M.A., Archdeacon of Manchester.

2d. **Cassell's New Standard Drawing Copies.** 6 Books. Each. *Advanced, 3d. and 4d.*

Cassell's School Board Arithmetics.

Cassell's Modern School Copy Books. 12 Books. Each.

Cassell's Graduated Copy Books. 18 Books. Each.

The Polytechnic Building Construction Plates. A Series of 40 Drawings. 18d. each.

3d. **Cassell's "Belle Savauge" Readers.** An entirely New Series. Fully Illustrated. Strongly bound in Cloth. From 3d. to 1s. 6d. each.

Official Illustrated Railway Guides. Abridged and Popular Editions. Paper covers. Each.

Great Western Railway.	Great Eastern Railway.
Midland Railway.	London and South Western Railway.
Great Northern Railway.	
London, Brighton and South Coast Railway.	London and North-Western Railway.
South Eastern Railway.	

CASSELL'S NATIONAL LIBRARY. Paper covers, 3d. each; cloth, 6d. *A Complete List of Volumes free on application.*

Cassell's Readable Readers. Illustrated and strongly bound. Two Infant Readers, 6d. and 3d., and Six Books for the Standards, in very attractive cloth boards, 4d. each. *(List on application.)*

Cassell's Standard Drawing Copies. 6 Books. Each. *Advanced, 3d. and 4d.*

Cobden Club Pamphlets. *(List on application.)*

4d. **Notes and Illustrations of the Essentials of House Sanitation.** By Edward L. Mansfield, M.D., D.P.H.

The Wild Flowers Collecting-Book. The Sketches and Directions prepared by F. Edward Hulme, F.L.S., F.S.A. *Complete in Parts.* Each.

The Wild Flowers Painting Book. The Sketches and Directions prepared by F. Edward Hulme, F.L.S., F.S.A. *Complete in 6 Parts.* Each.

Cassell's Standard Drawing Copies. 2 Books. Each. *Advanced, 3d. and 4d.*

The Modern School Readers. Four Infant Readers at 3d. to 5d., and Six Books for the Standards at 7d. to 1s. 6d. *(A List on application.)*

The Modern Reading Sheets. In Three Series, each containing Twelve Sheets. 4to. 4d.

Readers for Infant Schools, Coloured. 3 Books. Each containing 48 pages, including 8 pages in Colours. Each.

EDUCATIONAL.

6d. **Cassell's Modern Geographical Readers.** From 6d. to 1s. 6d.

Shakespeare's Plays for School Use. Cloth. Each.
Richard III. Henry V. Hamlet. Julius Cæsar. Coriolanus. Richard II. King John. Merchant of Venice. Henry VIII.

Euclid, Cassell's First Four Books of. Paper, 6d. *(Cloth, 9d.)*

Drawing Books for Young Artists. Each.
How to Draw Elementary Forms, Models, &c.

Arithmetics, The "Belle Sauvage." By George Ricks, B.Sc. In 7 Books. Stands. I. to II., paper covers, 2d. each; cloth, 3d. each. Books for Stands. V. to VII., paper covers, 3d. each; cloth, 4d. each. Answers for each Standard, 3d.

Cookery for Schools. By Lizzie Heritage.

MISCELLANEOUS.

In a Conning Tower; or, How I Took H.M.S. "Majestic" into Action. By H. O. Arnold-Forster, M.P. With Original Illustrations by W. H. Overend. *Cheap Edition.*

Cassell's New Illustrated Guide to London. With Plans and Woodcuts.

Cassell's Pictorial Scrap Books. Twenty-four Books, each containing 32 pages. Each.

Footpaths and Commons, and Parish and District Councils. By Sir Robert Hunter, M.A. Paper, 6d.; cloth, 1s.

Uniform Imperial Postage. By Robert J. Beadon, M.A.

Shall we Know One Another in Heaven? By the Rt. Rev. J. C. Ryle, M.A., Bishop of Liverpool.

Cobden Club Pamphlets. *(List on application.)*

Imperial Federation. Report of the Conference.

CASSELL'S PICTURE STORY BOOKS.
Each containing Sixty Pages of Pictures, Stories, &c.

Little Tables.	Little Stories.	Auntie's Stories.
Bright Stars.	Daisy's Story Book.	Birdie's Story
Nursery Joys.	Dot's Story Book.	Book.
Pet's Posy.	A Nest of Stories.	A Sheaf of Tales.
Tiny Tales.	Good-Night Stories.	Dewdrop Stories.
	Chats for Small Chatterers.	

7d. **Cassell's "High School" Readers.** Illustrated and strongly bound. Six books at 7d. to 1s. 3d.

ILLUSTRATED BOOKS FOR THE LITTLE ONES. 9d.
Containing interesting Stories, with Full-page Illustrations. In Ten of some Picture Boards. *Also in cloth gilt, 1s.*

Bright Tales and Funny Pictures.
Merry Little Tales.
Little Tales for Little People.
Little People and their Pets.
Tales Told for Sunday.
Sunday Stories for Small People. [Sunday.
Stories and Pictures for Bible Pictures for Boys and Girls.
Firelight Stories.
Sunlight and Shade.
Rub-a-dub Tales. [Fur.
Fine Feathers and Fluffy
Scrambles and Scrapes.
Tittie Tattie Tales.
Wandering Ways.
Dumb Friends.
Up and Down the Garden.
All Sorts of Adventures.
Some Farm Friends.
Those Golden Sands.
Our Sunday Stories.
Our Holiday Hours.
Indoors and Out.
Little Mothers and their Children.
Our Schoolday Hours.
Creatures Tame.
Our Pretty Pets.
Creatures Wild.

Cassell's New Geographical Readers. With Numerous Illustrations in each Book. From 9d. to 1s. 6d. each.

Things New and Old; or, Stories from English History. By H. O. Arnold-Forster, M.P. Fully Illustrated. Strongly bound in Cloth. Standards I. and II., 2d. each. Standard III., 3d. Standard IV., 1s. 3d. Standards V. and VI., 1s. 6d. each. Standard VII., 1s. 8d.

THE WORLD'S WORKERS. 1/-
New and Original Volumes by Popular Authors. With Portraits. *Also in cloth gilt, 2s. 6d.*

John Cassell.
Charles Haddon Spurgeon.
Dr. Arnold of Rugby.
The Earl of Shaftesbury.
Sarah Robinson, Agnes Weston, & Mrs. Meredith.
Mary Carpenter and Mrs. Somerville.
Thomas A. Edison & Samuel F. B. Morse. By Dr. Denslow and J. Marsh Parker.
Charles Dickens. [Moore.
Sir Titus Salt and George
Florence Nightingale, Catherine Marsh, Frances Ridley Havergal, Mrs. Ranyard ("L. N. R.").
General Gordon.
Dr. Guthrie, Father Mathew, Elihu Burritt, Joseph Livesey.
Abraham Lincoln.
Sir Henry Havelock and Colin Campbell Lord Clyde.
David Livingstone.
George Müller and Andrew Reed.
Richard Cobden.
Handel.
Turner the Artist.
George and Robert Stephenson.
Benjamin Franklin.

SHILLING STORY BOOKS. All Illustrated, cloth gilt.
Bunty and the Boys.
The Heir of Elmdale.
The Mystery at Shoecliff School.
Claimed at Last, and Roy's Reward.
Thorns and Tangles.
The Cuckoo in the Robin's Nest.
John's Mistake.
The History of Five Little Pitchers who had very Large Ears.
Diamonds in the Sand.
Surly Bob.
The Giant's Cradle.
Snug and Dull, and other Stories.
Aunt Lorna's Locket.
Among the Redskins.
The Ferryman of Brill.
Harry Maxwell.
The Magic Mirror.
The Cost of Revenge.
Clever Frank.
A Bahamas Monarch.
Seventeen Cats.

EDUCATIONAL.

"Work" Handbooks. A Series of Illustrated Practical Manuals prepared *under the direction of* Paul N. Hasluck, Editor of *Work. (List on application.)*

Hand and Eye Training Cards for Class Use. By George Ricks. In 6 sets. Each.

Latin Primer, The First. By Prof. Postgate, M.A.

Science Applied to Work. By J. A. Bower. Illustrated.

Science of Everyday Life. By J. A. Bower. Illustrated.

Howard's Art of Reckoning. *(Class cards, and 5d.)*

Cassell's "Modern School" Test Cards. Seven Sets of 16 Cards in case. Each.

Cassell's "Combination" Test Cards. Six Sets of 36 Cards with Answers, in Packet. Each.

Flowers, Studies in. In Thirteen Packets, each containing Six Flowers. Each Packet.

Spelling, Morell's Complete Manual of.

Euclid, Cassell's. First Six Books, with the 11th and 12th of Euclid.

Cassell's Historical Readers.
The History of England for Elementary Schools. For UPPER STANDARDS.
Part II. From Elizabeth to Modern Times. 1s.

German Reading, First Lessons in. By A. Jagst.

Polytechnic Technical Scales. Set of 10 in cloth case.

Cassell's Miniature Library of the Poets. In Two Vols. Half cloth. Each. *Also in 3 vols.*

MISCELLANEOUS.

Life Assurance Explained. By William Schooling, F.R.S.

Conversations with Carlyle. By Sir Charles Gavan Duffy, K.C.M.G. Paper, also in cloth, 2s.

The People's Life of their Queen. By Rev. E. J. Hardy, M.A., Chaplain to H.M. Forces.

The Governor's Guide to Windsor Castle. By the Most Noble the Marquis of Lorne, K.T. Profusely Illustrated. Limp cloth tubes in cloth boards, gilt edges, 2s.6d.

Gladstone, William Ewart, The People's Life of. Profusely Illustrated.

Popular Control of the Liquor Traffic. By Dr. R. L. Gould. With an Introduction by the Rt. Hon. J. Chamberlain, M.P.

1/- *cont'd.*

Cassell's Guide to Employment in the Civil Service. *Twenty-sixth Edition.* Paper. *Also in cloth,* 1s. 6d.;

A Toy Tragedy. By Mrs. Henry de la Pasture.

Beneath the Banner: Being Narratives of Noble Lives and Brave Deeds. By F. J. Cross. Cloth limp, illustrated. *Also in cloth gilt, gilt edges,* 2s. 6d.

Good Morning! Good Night! Morning and Evening Readings for Children. Illustrated. Limp cloth. *Also cloth boards,* 2s.

The Llollandllaff Legends. By Louis Llollandllaff. *Also in cloth,* 2s.

Colonist's Medical Handbook, The. By E. A. Barton, M.D.

The Letters of "Vetus" on the Administration of the War Office.

A Shilling's-Worth of All Sorts.

Chips by an Old Chum; or, Australia in the Fifties.

An Address in School Hygiene. By Clement Dukes, M.D.

Bits and Bearing-Reins, and Horses and Harness. By E. J. Power.

The Old Fairy Tales. With Illustrations. Cloth.

Lawful Wedlock; or, How Shall I Make Sure of a Legal Marriage? By Two Barristers.

Advice to Women on the Care of their Health. By Florence Stacpoole. *Also in cloth,* 2s. 6d.

Our Sick and How to Take Care of Them; or, Plain Lessons on Sick Nursing at Home. By Florence Stacpoole. *Also in cloth,* 1s. 6d.

Life in our Villages. *Also in cloth,* 2s.

Our Home Army. By H. O. Arnold-Forster, M.P.

The Dwellings of the Poor. Report of the Mansion House Council. With Illustrations.

A Manual of Political Questions of the Day. By Sydney Buxton, M.P. Paper covers. *Also in cloth,* 1s. 6d.

The Sugar Convention. By the Rt. Hon. Lord Farrer.

Irish Parliament, The: from 1782 to 1800.

Irish Union, The: Before and After. By A. K. Connell. M.A. *Cheap Edition.* Paper covers.

How to Select Spectacles. By Dr. C. Bell Taylor.

Practical Kennel Guide. By Dick Shirley Shilders.

Cookery, Cassell's Shilling.

Choice Dishes at Small Cost. By A. G. Payne.

Cremation and Urn Burial. By W. Robinson. Illustrated.

Colonies and India, Our. By Prof. Ransome, M.A. Oxon.

Etiquette of Good Society. *New Edition.* Edited and Revised by Lady Colin Campbell. *Also in cloth,* 1s. 6d.

Photography for Amateurs. By T. C. Hepworth. Illustrated. *Also in cloth boards.*

The New "LITTLE FOLKS" Painting Book. Containing nearly 50 Outline Illustrations suitable for Colouring.

CASSELL'S SUNSHINE SERIES.

1s Vols. each. *Also in superfine cloth.*

The Select Works of George Combe. Issued by Authority of the Combe Trustees. *Popular Edition.* Each. (Net.)

The Constitution of Man. | Science and Religion.
Moral Philosophy. | Discussions on Education.
American Notes.

ILLUSTRATED OFFICIAL RAILWAY GUIDES.

In Paper. *Also in cloth,* 2s.;

London and North Western (*New and Revised Edition*).—Great Western (*New and Revised Edition*).—Midland.—Great Northern.—Great Eastern.—London and South Western.—London, Brighton and South Coast.—South Eastern.

RELIGIOUS.

"HEART CHORDS." Bound in cloth, red edges. Each.

My Comfort in Sorrow. By Hugh Macmillan, D.D.
My Work for God.
My Object in Life.
My Aspirations.
My Emotional Life.
My Body.
My Growth in Divine Life.
My Hereafter.
My Walk with God.
My Aids to the Divine Life.
My Sources of Strength.
My Father.
My Bible.
My Soul.

HELPS TO BELIEF. Edited by the Rev. Canon Shore, M.A.

Creation. By Harry Goudhurst, D.D., late Lord Bishop of Carlisle.
Prayer. By the Rev. Canon Shore, M.A.
The Divinity of Our Lord. By the Lord Bishop of Derry.
Miracles. By the Rev. Brownlow Maitland, M.A.
The Atonement. By William Connor Magee, D.D., late Archbishop of York.

Shortened Church Services and Hymns.

My Last Will and Testament. By HYACINTHE LOYSON (Père Hyacinthe). Translated by PARTAN WARE. *Also in cloth,* 1s. 6d.

1/- *cont'd.*

John Drummond Fraser. By Philalethes. A Story of Jesuit Intrigue in the Church of England. *Cheap Edition.*

Won at the Last Hole. A Golfing Romance. By M. A. Sedgart. Illustrated.

Lessons in Our Laws; or, Talks at Broadacre Farm. By H. F. Lester, B.A. Illustrated. In Two Parts. Each.

Object Lessons from Nature, for the Use of Schools. By Prof. L. C. Miall. Illustrated. New and enlarged Edition. Two Vols. Each.

Vegetarian Cookery. By A. G. Payne.

Cassell's New Poetry Readers. Illustrated. 12 Books in One Vol. cloth. (*See page* 3.)

Guide to Employment for Boys on leaving School. By W. S. Beard, F.R.G.S.

Carpentry Workshop Practice, Forty Lessons in.

Engineering Workshop Practice, Forty Lessons in.

Elementary Chemistry for Science Schools and Classes.

Twilight of Life, The. Words of Counsel and Comfort for the Aged. By John Ellerton, M.A.

Laws of Every-Day Life. By H. O. Arnold-Forster, M.P. Cloth.

Citizen Reader. By H. O. Arnold-Forster, M.P. Cloth. *Also a Scotch Edition, cloth,* 1s. 6d.)

Round the Empire. By G. R. Parkin. With a Preface by the Earl of Rosebery, K.G. Fully Illustrated.

Higher Class Readers, Cassell's. Illustrated Cloth. Each.

The Making of the Home. By Mrs. S. A. Barnett.

Temperance Reader, The. By Rev. J. Dennis Hird.

Little Folks' History of England. By Jas Craig-Knox. With 32 Illustrations. Cloth.

French, Key to Cassell's Lessons in. Cloth.

Experimental Geometry, First Elements of. By Paul Bert. Illustrated.

Principles of Perspective as Applied to Model Drawing and Sketching from Memory, The. By George Trobridge. (*Book,* 2s. 6d.)

Nursing for the Home and for the Hospital, A Handbook of. By C. J. Wood. (*Also in cloth,* 3s.)

Cassell's Popular Atlas. Containing 24 Coloured Maps.

BIBLE BIOGRAPHIES. Illustrated.

The Story of Joseph. By the Rev. George Bainton.
The Story of Moses and Joshua. By the Rev. J. Telford.
The Story of Judges. By the Rev. J. Telford.
The Story of Samuel and Saul. By the Rev. D. C. Tovey.
The Story of David. By the Rev. J. Wratislaw.
The Story of Jesus. In Verse. By J. R. Macduff, D.D.

THE WORLD IN PICTURES.

Handsomely Illustrated, and elegantly bound.

A Ramble Round France.
All the Russias.
Chats about Germany.
The Eastern Wonderland.
Peeps into China.
Glimpses of South America.
Round Africa.
The Land of Temples.
The Isles of the Pacific.
The Land of the Pyramids.

GIFT BOOKS FOR YOUNG PEOPLE.

By Popular Authors. With Illustrations in each. Cloth gilt.

The Boy Hunters of Kentucky. By Edward S. Ellis.
Red Feather: a Tale of the American Frontier. By Edward S. Ellis. (Symington, Seeking a City. By Maggie Browne.
Ruth's Pa's Reward; or, "If Wishes were Horses."
Frank's Life-Battle; or, The Three Friends.
Jack Marston's Anchor.
Fritters; or, "It's a Long Lane that has no Turning."
Mary Hook's Mistake; or, "Look before you Leap."
Ursula's Stumbling Block; or, "Pride comes before a Fall."
Ruth's Life Work; or, "No Pains, no Gains."
Rags and Rainbows: a Story of Thanksgiving.
Uncle Williams's Charge; or, The Broken Trust.
Pretty Pink's Purpose; or, The Little Street Merchants.
Turkey; or, "Those who Live in Glass Houses shouldn't Throw Stones."
The Two Hardcastles; or, "A Friend in Need is a Friend Indeed."
Tim Thomson's Trial; or, "All is not Gold that Glitters."

EIGHTEENPENNY STORY BOOKS.

All Illustrated throughout, and bound in cloth gilt.

Wee Willie Winkie.
Ups and Downs of a Donkey's Life.
Three Wee Ulster Lassies.
Up the Ladder.
Faith's Father.
By Land and Sea.
The Young Berringtons.
Tom Morris's Error.
Worth More than Gold.
Jeff and Leff. (Fire.
Through Flood — Through
Girl with the Golden Looks.
The Chip Boy; and other Stories.
Roses from Thorns.
Reggie, Rose, and the Emperor.
Stories of the Olden Time.
Dick's Hero; and other Stories.
The Old Fairy Tales. With Original Illustrations. Cloth. *Also in boards,* 1s.)

1 3

CASSELL'S "JAPANESE" LIBRARY.

Consisting of 12 Popular Works bound in Japanese style. Each. (Net.)

Handy Andy.—Oliver Twist.—Ivanhoe.—Ingoldsby Legends.—The Last of the Mohicans.—The Last Days of Pompeii.—The Yellowplush Papers.—The Last Days of Palmyra.—Jack Hinton, the Guardsman.—Selections from Hood's Works.—American Humour.—Tower of London.

1/4

CASSELL'S POCKET LIBRARY. Edited by Max Pemberton. Cloth, gilt, 1s.

The Paying Guest. By George Gissing.
Lazy Bonnair's Experiment. By Tighe Hopkins.
A Whirl Asunder. By Gertrude Atherton.
The Little Huguenot. By Miss Pemberton.
A White Baby. By James Welch.
A King's Diary. By Percy White.
Other Volumes in preparation.

British Museum, The Bible Student in the. By the Rev. T. G. Kitchin, M.A. *New and Revised Edition.*

1/6

Rhymes for the Young Folk. By William Allingham. Boards.

In the Days of King George. By Col. Percy Groves. With Four Full-page Illustrations.

Gleanings from Patent Laws of all Countries, with Notices. By W. Lloyd Wise, J.P., C.C. Vol. I.

1/6 *cont'd.*

Woodwork for Boys on leaving School. By W. S. Beard, F.R.G.S.

Carpentry Workshop Practice, Forty Lessons in.

Engineering Workshop Practice, Forty Lessons in.

Elementary Chemistry for Science Schools and Classes.

Twilight of Life, The. Words of Counsel and Comfort for the Aged. By John Ellerton, M.A.

Laws of Every-Day Life. By H. O. Arnold-Forster, M.P. Cloth.

Citizen Reader. By H. O. Arnold-Forster, M.P. Cloth. (*Also a Scotch Edition, cloth,* 1s. 6d.)

Round the Empire. By G. R. Parkin. With a Preface by the Earl of Rosebery, K.G. Fully Illustrated.

Higher Class Readers, Cassell's. Illustrated Cloth. Each.

The Making of the Home. By Mrs. S. A. Barnett.

Temperance Reader, The. By Rev. J. Dennis Hird.

Little Folks' History of England. By Jas Craig-Knox. With 32 Illustrations. Cloth.

French, Key to Cassell's Lessons in. Cloth.

Experimental Geometry, First Elements of. By Paul Bert. Illustrated.

Principles of Perspective as Applied to Model Drawing and Sketching from Memory, The. By George Trobridge. (*Book,* 2s. 6d.)

Nursing for the Home and for the Hospital, A Handbook of. By C. J. Wood. (*Also in cloth,* 3s.)

Cassell's Popular Atlas. Containing 24 Coloured Maps.

BIBLE BIOGRAPHIES. Illustrated.

The Story of Joseph. By the Rev. George Bainton.
The Story of Moses and Joshua. By the Rev. J. Telford.
The Story of Judges. By the Rev. J. Telford.
The Story of Samuel and Saul. By the Rev. D. C. Tovey.
The Story of David. By the Rev. J. Wratislaw.
The Story of Jesus. In Verse. By J. R. Macduff, D.D.

THE WORLD IN PICTURES.

Handsomely Illustrated, and elegantly bound.

A Ramble Round France.
All the Russias.
Chats about Germany.
The Eastern Wonderland.
Peeps into China.
Glimpses of South America.
Round Africa.
The Land of Temples.
The Isles of the Pacific.
The Land of the Pyramids.

GIFT BOOKS FOR YOUNG PEOPLE.

By Popular Authors. With Illustrations in each. Cloth gilt.

The Boy Hunters of Kentucky. By Edward S. Ellis.
Red Feather: a Tale of the American Frontier. By Edward S. Ellis. (Symington.
Seeking a City. By Maggie Browne.
Ruth's Pa's Reward; or, "If Wishes were Horses."
Frank's Life-Battle; or, The Three Friends.
Jack Marston's Anchor.
Fritters; or, "It's a Long Lane that has no Turning."
Mary Hook's Mistake; or, "Look before you Leap."
Ursula's Stumbling Block; or, "Pride comes before a Fall."
Ruth's Life Work; or, "No Pains, no Gains."
Rags and Rainbows: a Story of Thanksgiving.
Uncle Williams's Charge; or, The Broken Trust.
Pretty Pink's Purpose; or, The Little Street Merchants.
Turkey; or, "Those who Live in Glass Houses shouldn't Throw Stones."
The Two Hardcastles; or, "A Friend in Need is a Friend Indeed."
Tim Thomson's Trial; or, "All is not Gold that Glitters."

EIGHTEENPENNY STORY BOOKS.

All Illustrated throughout, and bound in cloth gilt.

Wee Willie Winkie.
Ups and Downs of a Donkey's Life.
Three Wee Ulster Lassies.
Up the Ladder.
Faith's Father.
By Land and Sea.
The Young Berringtons.
Tom Morris's Error.
Worth More than Gold.
Jeff and Leff. (Fire.
Through Flood — Through
Girl with the Golden Looks.
The Chip Boy; and other Stories.
Roses from Thorns.
Reggie, Rose, and the Emperor.
Stories of the Olden Time.
Dick's Hero; and other Stories.
The Old Fairy Tales. With Original Illustrations. Cloth. *Also in boards,* 1s.)

THE LIBRARY OF WONDERS.

Illustrated Gilt Books for Boys. Crown 8vo, cloth.

Wonders of Bodily Strength and Skill.—Wonderful Escapes.—Wonders of Animal Instinct.—Wonderful Balloon Ascents.

1 9

Physiology for Schools. By Alfred T. Schofield, M.D., M.R.C.S., &c. Illustrated. Cloth. (*Also in Three Parts, paper covers, 3d. each; or cloth limp,* 6d. *each;*)

EDUCATIONAL.

2/-

Hand and Eye Training. By G. Ricks, B.Sc., and J. Vaughan. Illustrated. Vol. I., Designing with Coloured Papers: Vol. II., Designing on Cardboard. Vol. III., Colour Work and Design, 3s.)

Historical Cartoons, Cassell's Coloured. Size 45 in. by 35 in. Six. Each. (*See page* 11, *end of* 3.)

Practical Solid Geometry, A Manual of. By William Gerrish Rees, Major R.E.

2/- *cont'd.*

EDUCATIONAL *(continued).*

Applied Mechanics. By Sir R. Stawell Ball, LL.D.

Linear Drawing. By E. A. Davidson.

Orthographic and Isometrical Projection.

Building Construction, The Elements of.

Systematic Drawing and Shading. By Charles Ryan.

Jones's Book-keeping. By Theodore Jones. For Schools, 2s.; for the Million, 1s. 6d. *Also in cloth, 3s.* Ruled Books, 2s.

Reading Sheets, Modern. 3 Series. Each. *(Also on linen, with rollers, 1s. extra.)*

THE "SELLE SAUVAGE" LIBRARY. Cloth. Each.

The Fortunes of Nigel.
Guy Mannering.
Shirley.
Counigsby.
Mary Barton.
The Antiquary.
Nicholas Nickleby. (2 Vols.)
Jane Eyre.
Wuthering Heights.
The Prairie.
Night and Morning.
Knuilworth.
Ingoldsby Legends.
Tower of London.
The Pioneers.
Charles O'Malley.
Barnaby Rudge.
Cakes and Ale.
The King's Own.
People I have Met.
The Pathfinder.
Evelina.
Scott's Poems.
Last of the Barons.
Adventures of Mr. Ledbury.
Ivanhoe.
Oliver Twist.
Selections from Thomas Hood's Works.
Longfellow's Prose Works.
Sense and Sensibility.
Lord Lytton's Plays.
Bret Harte—Tales, Poems, &c.
Sheridan's Plays.

The Prince of the House of David.
Uncle Tom's Cabin.
Eugene Aram.
Jack Hinton, the Guardsman.
Rome and the Early Christians.
Thackeray's Yellowplush Papers.
Doerslayer.
Washington Irving's Sketch Book.
Last Days of Palmyra.
Tales of the Borders.
Pride and Prejudice.
Last of the Mohicans.
The Old Curiosity Shop.
Rienzi.
The Talisman.
The Heart of Midlothian.
The Last Days of Pompeii.
Scottish Chiefs.
American Humour.
Martin Chuzzlewit.
Selected Essays.
Harry Lorrequer.
The Pickwick Papers (2 Vols.
Scarlet Letter.
Handy Andy.
The Hour and the Man.
Old Mortality.
Edgar Allan Poe. (Prose and Poetry, Selections from.)
Margaret Lyndsay.

MISCELLANEOUS.

Poverty Corner. By George Manville Fenn.

The Still House of O'Darrow. By Irving Bacheller.

Successful Life, The. By an Elder Brother. Cheap Edition.

Gentleman, The Perfect. By the Rev. A. Smythe-Palmer, D.D. Cheap Edition.

The London Health Laws. Prepared by the Mansion House Council on the Dwellings of the Poor.

Campaigns of Curiosity. By Elizabeth L. Banks. Illustrated.

Modern Dressmaking, The Elements of. By Jennette E. Jones. Illustrated.

Gas, The Art of Cooking by. By Marie Jenny Sugg. Illustrated.

Hiram Golf's Religion; or, The Shoemaker by the Grace of God.

Cassell's Popular Cookery. With Coloured Plates.

The Voter's Handbook. By W. V. K. Fane (of the Inner Temple) and A. H. Verdon (of the Middle Temple). Cloth limp.

How Dante Climbed the Mountain. By Edward E. Sellic. Illustrated.

Cassell's Book of In-door Amusements, Card Games, and Fireside Fun. Illustrated.

John Strohar, Clk. By the Author of "Columbine Folk."

Short Studies from Nature. Illustrated.

The World's Lumber Room. By Selina Gaye.

THE "GOLDEN MOTTOES" SERIES.

Each Book containing 248 pages, with Four full-page Original Illustrations. Crown 8vo, cloth gilt, 2s. 6d.

"Nil Desperandum." By the Rev. F. Langbridge, M.A.
"Bear and Forbear." By Sarah Pitt.
"He Conquers who Endures." By the Author of "May Cunningham's Trial," &c.
"Honour is my Guide." By Florence Kingsford Bell (Mrs. Acton).
"Aim at the Sure End." By Emily Searchfield.
"Foremost if I Can." By Helen Atteridge.

TWO-SHILLING STORY BOOKS.

All Illustrated throughout, and containing stories for Young People. Crown 8vo, handsomely bound in cloth gilt.

Margaret's Enemy.
The Top of the Ladder: How to Reach it.
Stories of the Tower.
Mr. Burke's Nieces.
May Cunningham's Trial.
Poppy and other Tales.
"Little Folks" Sunday Book.
The Children of the Court.
Four Cats of the Tipperrons.
Marion's Two Homes.
Little Flotsam.
Madge and her Friends.
Through Peril to Fortune.
Aunt Diana's Wish.
In Mischief Again.
Two Poppenny Bits.
Poor Nelly.
From the Orient.
Maud Marjory.

2/6

CASSELL'S MINIATURE LIBRARY OF THE POETS.

In Two Volumes, cloth, gilt edges, in Paper Box, per set. *(See also* 1/.)

Milton - - - 2 Vols.
Wordsworth - 2 Vols.
Longfellow - 2 Vols.
Scott - - - 2 Vols.
Hood - - - 2 Vols.
Burns - - - 2 Vols.
Byron - - - 2 Vols.
Sheridan (and Goldsmith) 2 Vols.

"WANTED—A KING" SERIES.

Cheap Edition. Illustrated.

Fairy Tales in Other Lands. By Julia Goddard.
Robin's Ride. By Ellinor Davenport Adams.
Great-Grandmamma. By Georgina M. Synge.
Wanted—a King; or, How Merlin set the Nursery Rhymes to Rights. By Maggie Browne.

THE "CROSS AND CROWN" SERIES.

With Four Illustrations in each Book, printed on a Tint.

In Letters of Flame. Through Trial to Triumph. Strong to Suffer. Adam Hepburn's Vow.

By Fire and Sword: A Story of the Huguenots. No. XIII.; or, the Story of the Lost Vestal.

BOOKS BY EDWARD S. ELLIS. Illustrated.

Shod with Silence.
The Phantom of the River.
The Great Cattle Trail.
The Path in the Ravine.
The Young Ranchers.
Lost in Samoa.
Tad; or, "Getting Even" with Him.
The Hunters of the Ozark.
The Camp in the Mountains.
The Last War Trail.

Ned in the Woods.
Ned on the River.
Ned in the Block House: A Story of Pioneer Life in Kentucky.
The Lost Trail.
Camp-Fire and Wigwam.
Footprints in the Forest.
Down the Mississippi.
Lost in the Wilds.
Up the Tapajos; or, Adventures in Brazil.

HALF-CROWN GIFT BOOKS.

Illustrated. Crown 8vo, cloth gilt.

Pen's Perplexities. By Adeline Sergeant.
Nobby: A Seaside Shipwrecks. At the South Pole.

POPULAR VOLUMES FOR YOUNG PEOPLE.

Pleasant Work for Busy Fingers; or, Kindergarten at Home. By Maggie Browne. Illustrated.
The Cost of a Mistake. By Sarah Pitt. Illustrated.
Little Mother Bunch. By Mrs. Molesworth. Illustrated.
The Peep of Day. An Old Friend in a New Dress. Illustrated
Wild Adventures in Wild Places. By Dr. Gordon Stables, R.N. Illustrated.
Pictures of School Life and Boyhood. Selected from the Best Authors. Edited by Percy Fitzgerald.
Perils Afloat and Brigands Ashore. By Alfred Elwes.
Freedom's Sword: A Story of the Days of Wallace and Bruce. By Annie S. Swan.
Modern Explorers. By T. Frost. Illustrated.
Decisive Events in History. By James Archer. Illustrated.
The True Robinson Crusoes. Cloth gilt.
Early Explorers. By Thomas Frost. Illustrated.
Home Chat with our Young Folks. Illustrated throughout.
Jungle, Peak, and Plain. Illustrated throughout.
Peeps Abroad for Folks at Home. Illustrated.
Heroes of Every-day Life. By Lucas Lane. Illustrated.
Rambles Round London. By Mateaux.
Around and About Old England. By C. L. Mateaux.
For Queen and King. By Henry Frith.
Esther West. By Isa Craig-Knox. Illustrated.
Working to Win. By Maggie Symington. Illustrated.
Paws and Claws. By one of the Authors of "Poems Written for a Child."
In Quest of Gold; or, Under the Whanga Falls.
On Board the "Esmeralda"; or, Martin Leigh's Log.
The Romance of Invention: Vignettes from the Annals of Industry and Science.
Heroes of the Indian Empire. By Ernest Foster.

EDUCATIONAL.

Agriculture Text-Books, Cassell's. (The "Downton" Series.) Edited by John Wrightson, M.R.A.C., F.C.S., Professor of Agriculture. Fully Illustrated. Each, 2s. 6d.
Farm Crops. By Professor Wrightson.
Soils and Manures. By J. M. H. Munro, D.Sc. (Lond.), F.I.C., F.C.S.
Live Stock. By Professor Wrightson.
Sculpture, A Primer of. By E. R. Mullins.
Numerical Examples in Practical Mechanics and Machine Design. By R. G. Blaine, M.E. *Cheap Edition, Revised and Enlarged.* With 29 Illustrations.
Latin Primer (The New). By Prof. J. P. Postgate
Latin Prose for Lower Forms. By M. A. Bayfield, M.A.
Chemistry, The Public Schools. By J. H. Appleton, M.A.
Oil Painting, A Manual of. By the Rev. John Collier. Cloth.
French Reader, Cassell's Public School. By Guillaume S. Lemaitre.
French Grammar, Marlborough. Arranged and Compiled by Rev. J. F. Bright, M.A. Cr. 8vo, cloth, 3s. 6d.
Algebra, Manual of. By Galbraith and Haughton. Part I. Cloth. *Complete*, 2s. 6d.
Optics. By Galbraith and Haughton.
Euclid. Books I., II., III. By Galbraith and Haughton. Books IV., V., VI. By Galbraith and Haughton.
Plane Trigonometry. By Galbraith and Haughton. Cloth.
French, Cassell's Lessons in. Parts I. and II. Cloth. Each. *Complete in one volume.*
"Model Joint" Wall Sheets, for Instruction in Manual Training. By S. Barter. Eight Sheets. Each.

MISCELLANEOUS.

Schoolmaster Sketches. By T. J. Macnamara.
Three Years with Lobengula and Experiences in South Africa. By J. Cooper Clarke. Cheap Edition.
They Met in Heaven. By C. H. Hepworth.
A Book of Absurdities. For Children of from Seven Years of Age to Seventy. By an Old Vagabond.
The Breech-loader, and How to Use It. By W. W. Greener. Illustrated. *New and Enlarged Edition.*
Cottage Gardening, Poultry, Bees, Allotments, Food, House, Window and Town Gardens. Edited by W. Robinson, B.L.Sc. Fully Illustrated. In Half-yearly Volumes. III., III., V., VI., and VII.: Each, Two Vols., 3s.
Liquor Legislation in the United States and Canada. By S. L. Fanshawe, of the Inner Temple, Barrister.
Field Naturalist's Handbook, The. By the Revs. J. G. Wood and Theodore Wood. *Cheap Edition.*
The Art of Making and Using Sketches. From the French of G. Fraipont. By Clara Bell. With Fifty Illustrations.
Geometrical Drawing for Army Candidates. By H. T. Lilley, M.A. *New and Enlarged Edition.*
Free Public Libraries. By Thomas Greenwood, F.R.G.S. *New and Enlarged Edition.* Illustrated.
National Railways. An Argument for State Purchase. By James Hole.
Nursing of Sick Children, A Handbook for the. By Catherine J. Wood.

2/6 *cont'd.*

2/6 *cont'd.*

Mechanics for Young Beginners, A First Book of. By the Rev. Harry Clarke, M.A. Illustrated.

Nature's Wonder Workers. By Kate R. Lovell. Illustrated.

Browning, An Introduction to the Study of. By Mrs. Sutherland Orr.

The England of Shakespeare. By E. Goadby. Illustrated.

Ships, Sailors, and the Sea. By R. J. Cornewall-Jones. Illustrated. *Cheap Edition.*

Unicode. The Universal Telegraphic Phrase Book. Desk and Pocket Editions. Each

Bo-Peep. A Treasury for the Little Ones. Yearly Volume. Boards. 160 pp. 2/6

Sent Back by the Angels, and other Ballads. By the Rev. J. Langmore. Illustrated. 2/6

New Testament, An Introduction to the.

Miniature Cyclopædia, Cassell's, containing 30,000 Subjects. Cloth. *Also in half roxburgh, 4/6.*

Signs, Christ's. Evidences of Christianity set forth in the Person and Work of Christ. By the Rev. James Aitchison.

The Lady's Dressing-Room. Translated from the French by Lady Colin Campbell.

Fairway Island. By Horace Hutchinson. Illustrated.

Diet and Cookery for Common Ailments. By a Fellow of the Royal College of Physicians and Phyllis Browne.

Lost on Du Corrig; or, 'Twixt Earth and Ocean. By Standish O'Grady. With 8 full-page Illustrations.

3/-

TECHNICAL MANUALS (Illustrated).

The Elements of Practical Perspective.	Drawing for Cabinetmakers.
Model Drawing.	Drawing for Bricklayers.
Drawing for Stonemasons.	Gothic Stonework.

Cassell's New Coloured Natural History Wall Sheets. Consisting of 10 Subjects. Size—39 by 31 in. Mounted on rollers and varnished. 30/-

How to Shade from Models, Common Objects, and Casts of Ornament. A Practical Manual. By W. E. Sparkes

Practical Plane and Solid Geometry, including Graphic Arithmetic. Vol. I., Elementary Stage.

Elementary Flower Painting. With Eight Coloured Plates and Wood Engravings.

Sepia Painting, A Course of. Two Vols. Each. *In one Vol., 5s.*

Marlborough Arithmetic Examples.

Tides and Tidal Currents. By Galbraith and Haughton.

SCHOOL COMMENTARIES. Edited by Bishop Ellicott.

Genesis. (3s. 6d.)	Romans. (2s. 6d.)
Exodus. (3s.)	Corinthians I. and II. (3s.)
Leviticus. (3s.)	Galatians, Ephesians, and Philippians. (3s.)
Numbers. (2s. 6d.)	Colossians, Thessalonians, and Timothy. (3s.)
Deuteronomy. (2s. 6d.)	Titus, Philemon, Hebrews, and James. (3s.)
St. Matthew. (3s. 6d.)	Peter, Jude, and John. (3s.)
St. Mark. (3s.)	The Revelation. (3s.)
St. Luke. (3s. 6d.)	An Introduction to the New Testament. (3s. 6d.)
St. John. (3s. 6d.)	
The Acts of the Apostles. (3s. 6d.)	

THE WORLD'S WORKERS.

New and Original Volumes by Popular Authors. With Portraits. In Seven Vols., each containing a Sketch and Portrait. Each Vol. 3/6

*** Each work can also be had separately. *(See p.)*

The Century Science Series. Edited by Sir Henry E. Roscoe, D.C.L., F.R.S. Crown 8vo. Each.

John Dalton and the Rise of Modern Chemistry. By Sir Henry E. Roscoe, F.R.S.

Major Rennell, F.R.S., and the Rise of English Geography. By Sir Clements R. Markham, C.B., F.R.S.

Justus von Liebig: His Life and Work. By W. A. Shenstone.

The Herschels and Modern Astronomy. By Miss Agnes M. Clerke.

Charles Lyell and Modern Geology. By Rev. Professor T. G. Bonney, F.R.S.

J. Clerk Maxwell and Modern Physics. By R. T. Glazebrook, F.R.S.

Humphry Davy. By T. E. Thorpe, F.R.S.

Charles Darwin and the Theory of Natural Selection. By Edward B. Poulton, M.A., F.R.S.

Other Volumes in Preparation.

EDUCATIONAL.

Cassell's English Dictionary. Giving Definitions of more than 100,000 Words and Phrases. *Cheap Edition.* Cloth. Superior Edition, 5/-

Cassell's New Biographical Dictionary. Containing Memoirs of the Most Eminent Men and Women of all Ages and Countries. *Cheap Edition.*

Drawing for Carpenters and Joiners. By E. A. Davenport. With 212 Engravings.

Practical Mechanics. By Prof. Perry, M.E.

Cutting Tools Worked by Hand and Machine. By Prof. Smith.

Handrailing and Staircasing. By Frank O. Cresswell.

Hydrostatics. By Galbraith and Haughton. Cloth.

Mathematical Tables. By Galbraith and Haughton.

Mechanics. By Galbraith and Haughton. Cloth.

Linear Drawing and Projection. Two Vols. in One

German Dictionary, Cassell's New. German-English and English-German. Cloth. *Also in half morocco, 5/-*

This World of Ours. By H. O. Arnold-Forster, M.P. Being Introductory Lessons on Physical Geography.

Colour. By Prof. A. H. Church. *New and Enlarged Edition.*

English Literature, The Story of. By Anna Buckland.

Italian Lessons, with Exercises, Cassell's.

German Grammar, The Groundwork of. Simplified and Arranged by the Rev. J. F. Bright, M.A. Cloth.

French Exercises, Marlborough. By the Rev. G. W. De Lisle, M.A. Issued in Monthly Parts, each containing

French-English and English-French Dictionary. *(All Cassell morocco 5/-*

Cassell's New Latin Dictionary. *(Also in half morocco, 5/-*

Alphabet, Cassell's Pictorial, and Object Lesson Sheet for Infant Schools.

THE FIGUIER SERIES.

Cheap Editions. Illustrated throughout.

The Insect World.	The Ocean World.
Reptiles and Birds.	The World before the Deluge.
The Human Race.	Man for Himself.
The Vegetable World.	

CASSELL'S POPULAR LIBRARY OF FICTION.

The Squire. By Mrs. Parr.

A Modern Dick Whittington. By James Payn

A Blot of Ink. Translated by Q and Paul Francke.

The Avenger of Blood. By J. Maclaren Cobban.

The Doings of Raffles Haw. By A. Conan Doyle.

The Man in Black. By Stanley Weyman. Illustrated.

Father Stafford. A Novel. By Anthony Hope.

The Medicine Lady. By L. T. Meade.

Leona. By Mrs. Molesworth.

"La Bella," and others. By Egerton Castle.

Out of the Jaws of Death. By Frank Barrett.

Fourteen to One, &c. By Elizabeth Stuart Phelps.

Dr. Dumány's Wife. By Maurus Jokai.

The Lights of Sydney. By Lilian Turner. With Eight Illustrations.

Merry Girls of England. By Mrs. L. T. Meade. With Eight Full-page Plates.

Ia: A Love Story. By Q. Illustrated.

A King's Hussar. By Herbert Compton.

Playthings and Parodies. Short Stories, Sketches, &c., by Barry Pain.

The Red Terror: A Story of the Paris Commune. By Edward King. Illustrated.

An Old Boy's Yarns. By Harold Avery. With 8 Plates.

A World Beneath the Waters; or, Merman's Land. By Rev. Gerard W. Bates.

A Ride to Khiva. By Fred Burnaby. New Edition. Illustrated.

The Little Squire. By Mrs. Henry De La Pasture.

Zero, the Slaver. A Romance of Equatorial Africa. By Lawrence Fletcher.

Into the Unknown: A Romance of South Africa. By Lawrence Fletcher.

Locomotive Engine, The Biography of a. By Henry Irwin. Illustrated.

Mount Desolation. An Australian Romance. By W. Carlton Dawe.

Magic at Home. By Prof. Hoffman. Fully Illustrated.

Some Legendary Landmarks of Africa. By Mrs. Hamilton Evans.

Old and New Testaments, Plain Introductions to the Books of the. Reprinted from Bishop Ellicott's Bible Commentary. In Two Volumes. Each.

The Life of Christ. By the Very Rev. Dean Farrar, D.D., F.R.S. With 20 Full-page Plates. *Cheap Edition.* Cloth gilt. *Superior Edition, with Gilt edges, 3s. 6d.*

Joy and Health. Poems by Martellius. Illustrated. (Also an *Edition de Luxe, 7s. 6d.*)

Story Poems for Young and Old. Edited by E. Davenport. *Cheap Edition.*

Shaftesbury, K.G., The Seventh Earl of, The Life and Work of. By Edwin Hodder. Illustrated. *Cheap Edition.*

The Ladies' Physician. A Guide for Women in the Treatment of their Ailments. By A Physician. *Cheap Edition, Revised and Enlarged.*

Beetles, Butterflies, Moths, and other Insects. By A. W. Kappel, F.L.S., and W. Egmont Kirby. With Coloured Plates.

The Carnation Manual. Edited and Published by the National Carnation and Picotee Society (Southern Section).

Artistic Anatomy. By Prof. W. Dawal. *Cheap Edition.*

The English School of Painting. *Cheap Edition.*

Buckinghamshire Sketches. By F. S. Roscoe. With Illustrations by H. R. Bloomer.

Verses, Wise or Otherwise. By Ellen Thorneycroft Fowler.

Verses Grave and Gay. By Ellen Thorneycroft Fowler.

Italy from the Fall of Napoleon I. in 1815 to 1890. By J. W. Probyn. *Revised and Enlarged Edition.*

Disraeli, Benjamin, Personal Reminiscences of. By Henry Lake. With Two Portraits. 6/-

Life of Nelson. By Robert Southey. Illustrated.

The Law of Musical and Dramatic Copyright.

Aubrey de Vere's Poems. A Selection. Edited by John Dennis.

Shakspere, The Leopold. With about 400 Illustrations. Cloth. *Also in 3 parts, 2/6 each.*

Culinshire Folk. By the Author of "John Orlebar," &c.

A Year's Cookery. By Phyllis Browne. *Cheap Edition, Revised and Edited.*

Sports and Pastimes, Cassell's Complete Book of. *Cheap Edition, with over 400 Illustrations.* Cloth.

Poultry-Keeper, The Practical. By Lewis Wright. With Numerous Woodcuts.

Pigeon Keeper, The Practical. By Lewis Wright.

Rabbit Keeper, The Practical. By Cuniculus.

THE "TREASURE ISLAND" SERIES.

CHEAP ILLUSTRATED EDITIONS.

Treasure Island. By R. L. Stevenson.

The Master of Ballantrae. By R. L. Stevenson.

The Black Arrow. By R. L. Stevenson.

King Solomon's Mines. By H. Rider Haggard.

YOUNG PEOPLE'S STORY BOOKS.

Cheap Editions. With Original Illustrations. Cloth gilt.

Under Bayard's Banner. By Henry Frith.

The Champion of Odin. By J. Frederick Hodgetts.

Bound by a Spell. By the Hon. Mrs. Greene.

BOOKS FOR YOUNG PEOPLE.

Bob Lovell's Career. A Story of American Railway Life. By Edward S. Ellis.

Fairy Tales Far and Near. Retold by T.

To Punish the Czar: A Story of the Crimea. By Hugh Hutchinson. Illustrated.

Told Out of School. By A. J. Daniels. Illustrated.

A Sunday Story-Book. By Maggie Browne, Sam Browne, and Nanz Ethel. Illustrated.

A Bundle of Tales. By Maggie Browne, Sam Browne, and Nanz Ethel. Illustrated.

A Book of Merry Tales. By Maggie Browne, "Sheila," Isabel Wilson, and C. L. Matheson. Illustrated.

The Sunday Scrap-Book. Containing several hundred Scripture Subjects in Pictures. Boards. (Also in cloth, 2s.)

Æsop's Fables. *Cheap Edition.* Cloth. *(Also in cloth, bevelled boards, gilt edges, 5/-*

The Chit-Chat Album. Illustrated throughout.

Picture Album of All Sorts. With Full-page Illustrations.

My Own Album of Animals.

Album for Home, School, and Play. Containing numerous Stories by popular Authors.

3/6 *cont'd.*

3/6 *cont'd.*

Bo-Peep. A Treasury for the Little Ones. Illustrated throughout. Cloth gilt. Yearly Volume. (See also 5s. 6d.)

Robinson Crusoe, Cassell's New Fine-Art Edition de Luxe. With upwards of 100 Original Illustrations by Walter Paget. *Cheap Edition.* Cloth gilt, (*Also in cloth, gilt edges, 5s.*)

Swiss Family Robinson, Cassell's. Illustrated. Cloth. (*Also in cloth, gilt edges, 5s.*)

The London, Brighton and South Coast Railway. Its Passenger Services, Rolling Stock, Locomotive Engineers, and Express Speeds. By the Author of "British Railways." With Two Plates.

Vicar of Wakefield, The, and other Works by Goldsmith. Illustrated. (*Also in cloth, gilt edges, 5s.*)

Gulliver's Travels. With Eighty-eight Engravings by Morten. Crown 4to, cloth. (*Also in cloth, gilt edges, 5s.*)

Little Folks (NEW AND ENLARGED SERIES). Half-Yearly Vols. With Six Full-page Coloured Plates and numerous other Pictures printed in Colour. Coloured boards. (*See also 5s.*)

POPULAR BOOKS FOR YOUNG PEOPLE.

Crown 8vo, with Eight Full-page Illustrations. Cloth gilt.

† **Red Rose and Tiger Lily.** By L. T. Meade. Illustrated.
† **A Sweet Girl Graduate.** By L. T. Meade. Illustrated.
† **Polly: A New-fashioned Girl.** By L. T. Meade. Illustrated.
† **A World of Girls: A Story of a School.** By L. T. Meade.
† **The Palace Beautiful.** A Story for Girls. By L. T. Meade.
† **Bashful Fifteen.** By L. T. Meade. Illustrated.
† **The White House at Ixch Gow.** By Sarah Pitt. Illustrated.
The King's Command: A Story for Girls. By Maggie Symington. Illustrated. *Cheap Edition.*
Lost among White Africans: A Boy's Adventures on the Upper Congo. By David Ker.
For Fortune and Glory, A Story of the Soudan War. By Lucas Heugh.
"Follow my Leader"; or, The Boys of Templeton. By Talbot Baines Reed.
For Glory and Renown. By D. H. Parry. With 8 Full-page Illustrations.
With Claymore and Bayonet. By Col. Percy Groves. Illustrated.
The Queen's Scarlet. Being the Adventures and Misadventures of Sir Richard Fryne. By George Manville Fenn. With Eight Full-page Illustrations.
Awkward Squads, The; and other Ulster Stories. By Shan F. Bullock.
Capture of the "Estrella," The. A Tale of the Slave Trade. By Commander Claud Harding, R.N.
Five Stars in a Little Pool. By Edith Charrington. Illustrated.

Books marked thus † can also be had in superior bindings, extra cloth gilt, gilt edges, 5s. each.

4/-

Building World. The New Practical Journal on Building and Building Trades. Half-yearly volumes.
Work. The Illustrated Journal for Mechanics. *New and Enlarged Series.* Half-Yearly Vols. VIII. and X. Each.

4/6

World of Wonders, The. Illustrated. *Cheap Edition.* In Two Vols. Each.
Watch and Clock Making. By D. Glasgow, Vice-President of the British Horological Institute.
Design in Textile Fabrics. By T. R. Ashenhurst. With Coloured and numerous other Illustrations.
Spinning Woollen and Worsted. By W. S. B. McLaren.
French, Cassell's Lessons in. *New and Revised Edition.* With Exercises in One Vol. *No Answers can be had.*
Drawing for Machinists and Engineers. By Ellis A. Davidson. With over 400 Illustrations.

5/-

ILLUSTRATED BOOKS FOR YOUNG PEOPLE.

Flora's Feast. A Masque of Flowers. By Walter Crane. With 40 pictures in Colours.
Little Folks. Half-Yearly Vols. *New and Enlarged Series.* With Six Full-page Coloured Plates and numerous other pictures printed in Colour. Cloth gilt, gilt edges. (*See also 3s. 6d.*)
Cassell's Dictionary of Cookery. With about 9,000 Recipes and Kws to the Principles of Cookery. Cloth.
Scarlet and Blue; or, Songs for Soldiers and Sailors. By John Farmer. (Words only, royal 32mo, 6d.)
Physiology for Students, Elementary. By Alfred T. Schofield, M.D., M.R.C.S. With Coloured Plates and numerous Illustrations. *New and Cheaper Edition.*
Popular Educator, Cassell's NEW. With Revised Text, New Maps, New Coloured Plates, New Type, &c. Complete in Eight Vols. Each. (*See also 7s. 6d.*)
Technical Educator, Cassell's New. An entirely New Cyclopædia of Technical Education, with Coloured Plates and numerous Engravings. Complete in Six Volumes. Each.
Gaudeamus. Songs for Colleges and Schools. Edited by John Farmer. (The words only, in paper covers, 6d.; cloth, 9d.) Can also be obtained in sheets containing the two Books bound and mixed in quantities of one dozen and upwards, at 4d. per sheet.
Dulce Domum. Rhymes and Songs for Children. Edited by John Farmer. Old Notation and Words. *N.B.—The Words of the Songs in "Dulce Domum" (with the Airs both in Tonic Sol-fa and Old Notation) can be had in Penny Books.*
Historical Cartoons, Cassell's Coloured. Six, Mounted on Canvas and Varnished, with rollers. Each. (Second and 3rd).
Dyeing of Textile Fabrics, The. By Prof. Hummel.
Steel and Iron. By Prof. W. H. Greenwood, F.C.S., &c.
Marine Painting. By Walter W. May, R.I. With Sixteen Coloured Plates.
Animal Painting in Water-Colours. With Eighteen Coloured Plates by Frederick Taylor.
Water-Colour Painting Book. By R. P. Leitch. With Coloured Plates.
Neutral Tint, A Course of Painting in. With Twenty-four Plates by R. P. Leitch.

China Painting. By Florence Lewis. With Sixteen Original Coloured Plates.

5/- *cont'd.*

Flowers, and How to Paint them. By Maud Naftel. With Ten Coloured Plates.

RELIGIOUS.

St. George for England: One and Other Sermons preached to Children. By the Rev. Canon Teignmouth Shore, M.A.
Life of the World to Come, The, and other Subjects. By the Rev. Canon Teignmouth Shore, M.A.

Q's Works, Uniform Edition of.

Dead Man's Rock.	The Blue Pavilions.
The Splendid Spur.	"I Saw Three Ships," and other Winter's Tales.
The Astonishing History of Troy Town.	Noughts and Crosses.

The Delectable Duchy.

Gleanings after Harvest. By the late John R. Vernon, M.A.
The Highway of Letters, and its Echoes of Famous Footsteps. By Thomas Archer. Illustrated.
The Home Life of the Ancient Greeks. Translated from the German of Prof. H. Blumner by Alice Zimmern. Illustrated. *Cheap Edition.*
Iron Prate, The. A Plain Tale of Strange Happenings on the Sea. By Max Pemberton. Illustrated.
To the Death. By K. D. Cherbuliez. With Four Plates.
Pomona's Travels. By Frank R. Stockton. Illustrated.
The Reputation of George Saxon. By Morley Roberts.
Anthea. By Cécile Cassavetti (A Russian). A story of the time of the Greek War of Independence. *Cheap Edition.*
Beyond the Blue Mountains. Illustrated. By L. T. Meade.
Industrial Freedom: A Study in Politics. By E. R. Wise.
Loans Manual. A Compilation of Tables and Rules for the Use of Loyal Authorities. By Charles F. Cutten, M.Inst.C.E., M.R.I.A.
Birds' Nests, Eggs, and Egg Collecting. By R. Kearton. With 32 Coloured Plates of Eggs. Fourth and Enlarged Edition.
Modern Shot Guns. By W. W. Greener. Illustrated.
English Writers. By Prof. H. Morley and Prof. Griffin. Vols. I. to VI. Each.
Vaccination Vindicated. By John C. McVail, M.D.
Medical and Clinical Manuals, for Practitioners and Students of Medicine. *Third Edition, thoroughly Revised and Enlarged.* In Two Vols. Each.
Household, Cassell's Book of the. In Four Vols. Each. (*See also 7s.*)
English Commons and Forests. By the Rt. Hon. G. Shaw-Lefevre.
Agrarian Tenures. By the Rt. Hon. G. Shaw-Lefevre.
Bunyan's Pilgrim's Progress, Cassell's. Illustrated. *Cheap and Revised Edition.*
Cassell's Concise Cyclopædia. With 600 Illustrations. A Cyclopædia in One Volume.

6/-

WORKS BY LEADING AUTHORS.

Extra crown 8vo, cloth. Each.

The Black Watch: The Record of an Historic Regiment. By Archibald Forbes, LL.D.
Sentimental Tommy. By J. M. Barrie.
What Cheer! By W. Clark Russell.
A Puritan's Wife. By Max Pemberton. Illustrated.
Mrs. Cliff's Yacht. By Frank Stockton.
The Rogue's March. By E. W. Hornung.
Tuxter's Little Maid. By G. B. Burgin.
From the Memoirs of a Minister of France. By Stanley Weyman.
The Adventures of David Balfour. By R. L. Stevenson. Illustrated. Each
Vol. I. **Kidnapped**
Vol. II. **Catriona.**
The Impregnable City. By Max Pemberton.
The Sea Wolves. By Max Pemberton. Illustrated.
'Lisbeth. A Novel. By Leslie Keith. Cheap Edition, in One Vol.
The Highway of Sorrow. By Hesba Stretton and ********.
A Prison Princess. By Major Arthur Griffiths.
The Admirable Lady Biddy Fane. By Frank Barrett. *New Edition.* With 12 full-page Illustrations.
Tiny Luttrell. By E. W. Hornung. Cloth. *Popular Edition.*
List, ye Landsmen! A Romance of Incident. By W. Clark Russell.
The Little Minister. By J. M. Barrie. *Illustrated Edition.*
The Wrecker. By Robert Louis Stevenson and Lloyd Osbourne. Illustrated.
Island Nights' Entertainments. By R. L. Stevenson. Illustrated.
The Story of Francis Cludde. By Stanley J. Weyman.
The Hispaniola Plate. By John Bloundelle-Burton.
A Free Lance in a Far Land. By Herbert Compton.
Adventures in Criticism. Consisting of Articles contributed to the *Speaker.* By A. T. Quiller Couch.
Wandering Heath. A Selection of Short Stories. By Q.
The White Shield. By Bertram Mitford.
Old Maids and Young. By Miss D'Esterre-Keeling.
The Adventures of Captain Horn. By Frank Stockton.
A Foot-Note to History: Eight Years of Trouble in Samoa. By R. L. Stevenson.
The Countries of the World. By Dr. Robert Brown, F.L.S. Illustrated. *Cheap Edition.* Vols. I., II., and III. Each. (Also in 6 Vols. 5s. 6d. each.)
Scotland, Picturesque and Traditional. By C. E. Byrne. With 16 Illustrations.
Pictorial New Zealand. With Preface by Sir W. R. Perceval, K.C.M.G., Agent-General for New Zealand. Illustrated.
Cassell's Universal Portrait Gallery. Containing 250 Portraits of Celebrated Men and Women of the Day. With brief memoirs, and *facsimile* autographs. In One Vol.
Cassell's New World of Wit and Humour. With New Pictures and New Text.

6/- *cont'd.*

Cookery Book, New Universal, Cassell's. By Lizzie Heritage. With 12 Coloured Plates and other Illustrations.

Natural History, Cassell's. Edited by Prof. P. Martin Duncan, M.B., F.R.S. In Three Double Vols. Each, Illustrated.

The Three Homes. By the Very Rev. Dean Farrar, D.D., F.R.S. In Three Parts. With 8 Full-page Illustrations.

Ballads and Songs. By William Makepeace Thackeray. With Original Illustrations by H. M. Brock. Cloth, gilt top.

Memories and Studies of War and Peace. By Archibald Forbes, LL.D. *See page 7.*

Loveday: A Tale of a Stirring Time. By A. E. Wickham. Illustrated.

From Independence Hall Around the World. By F. Carroll Brewster, LL.D. Fully Illustrated.

Henry Allon, D.D., Pastor and Teacher. The Story of his Ministry, with Selected Sermons and Addresses. By the Rev. W. Hardy Harwood.

Europe, Cassell's Pocket Guide to. Leather.

Star-Land. By Sir Robert Stawell Ball, LL.D. Illustrated.

Queen Summer; or, the Tourney of the Lily and the Rose. Containing 40 pages of Designs by Walter Crane, printed in Colours.

Hand and Eye Training. By G. Ricks, B.Sc. Two Vols., with Sixteen Pages of Coloured Plates in each Vol. Crown 4to. Each.

Bible Educator, The. Edited by the Very Rev. Dean Plumptre, D.D. Illustrated. Complete in Four Vols. Cloth, each. *(Also in Two Vols., 21s. or 24s.)*

7/6

EDUCATIONAL.

Figure Painting in Water-Colours. With Sixteen Coloured Plates. With Instructions by the Artists.

English Literature: A First Sketch of. By Prof. Henry Morley. *Revised and Enlarged Edition.*

Algebra, Manual of. By Gallbraith and Haughton.

English Literature, Library of. By Professor Henry Morley. With Illustrations taken from Original MSS. *Popular Edition.* Vol. I.: SHORTER ENGLISH POEMS. Vol. II.: ILLUSTRATIONS OF ENGLISH RELIGION. Vol. III.: ENGLISH PLAYS. Vol. IV.: SHORTER WORKS IN ENGLISH PROSE. Vol. V.: SKETCHES OF LONGER WORKS IN ENGLISH VERSE AND PROSE. Each. (*See also 7/6 & 5s.*)

Picturesque Australasia, Cassell's. With upwards of 1,000 Illustrations. Four Vols. Each.

Uncle Tom's Cabin. By Harriet Beecher Stowe. *Fine Art Illustrated Edition.* With upwards of One Hundred Original Illustrations by Jenny Nystrom-Edmond. Cloth gilt, gilt top.

The Life and Adventures of George Augustus Sala. By Himself. *Cheap Edition,* One Vol. (*Also Library Edition,* Two Vols., 28s.)

Britain's Roll of Glory; or, the Victoria Cross, its Heroes, and their Valour. By D. H. Parry. Illustrated.

Popular History of Animals. By Henry Scherren, F.Z.S. With 13 Coloured Plates and 160 Illustrations.

Royal Academy Pictures, 1896. In One Vol. (*See also 5/-*)

Family Magazine Volume, Cassell's. With about 250 Original Illustrations.

Cassell's Gazetteer of Great Britain and Ireland. Illustrated with Woodcuts and Maps in Colours. Vols. I., II., & III. Each.

Doré's Milton's Paradise Lost. Illustrated by Gustave Doré. *Popular Edition.* Cloth, gilt backstrip. (*See also 21s.*)

Doré's Dante's Purgatory and Paradise. Illustrated by Gustave Doré. *Popular Edition.* Cloth or buckram. (*See also 21s.*)

Doré's Dante's Inferno. Illustrated by Gustave Doré, with Introduction by A. J. Butler. *Popular Edition.* Cloth or buckram. (*See also 21s.*)

Cassell's Illustrated Bunyan. With 200 original Illustrations. *Cheap Edition.*

Municipal Taxation at Home and Abroad. By J. J. O'Meara.

The Story of Africa and its Explorers. By Dr. Robert Brown, F.L.S. Illustrated. Complete in Four Vols. Each.

Football, The Rugby Union Game. Edited by Rev. F. Marshall. *Revised, Enlarged Edition.* Illustrated.

Life and Letters of the Rt. Hon. Sir Joseph Napier, Bart., LL.D., &c., Ex-Lord Chancellor of Ireland. By Alex. Charles Ewald, F.S.A. *New and Revised Edition.*

Hygiene and Public Health. By B. Arthur Whitelegge, M.D. Illustrated. *New and Revised Edition.*

The Chess Problem. Text-Book with Illustrations. Containing 400 Positions selected from the Works of C. Planck and others.

Medical Handbook of Life Assurance. By J. E. Pollock, M.D., and J. Chisholm. *Revised Edition.*

Domestic Dictionary, Cassell's. Illustrated. 1,080 pages. Royal 8vo, cloth. (*Also in 2 volumes, 10s. 6d.*

Subjects of Social Welfare. By the Rt. Hon. Lord Playfair, K.C.B.

Saturday Journal, Cassell's. Yearly Volume. Illustrated.

Cities of the World. Illustrated. Complete with five Illustrations and Portraits. Complete in Four Vols. Each.

Peoples of the World, The. By Dr. Robert Brown. Illustrated. Six Vols. Each.

Year-Book of Treatment, The, for 1897. A Critical Review for Practitioners of Medicine. Thirteenth year of publication.

The Practitioner. A Journal of Practical Medicine. Edited by Malcolm Morris. In Half-Yearly Volumes. Illustrated.

Our Own Country. Complete in Six Vols. With 200 Original Illustrations in each Vol.

Natural History, Cassell's Concise. By Prof. E. Perceval Wright, M.A. Illustrated. Cloth. *Two kept half bound.*

RELIGIOUS.

7/6 *cont'd.*

"Quiver" Volume, The. *Cheap Illustrated Series.* With several hundred Illustrations. About 600 Original Illustrations. 7/6

New Light on the Bible and the Holy Land. By B. T. Davis, M.A. Illustrated.

Family Prayer Book, The. Edited by Rev. Canon Garbett, M.A., and Rev. S. Martin. With Full-page Illustrations. *New Edition. Also in morocco, 18s.*

Cassell's Concise Bible Dictionary. By the Rev. Robert Hooper, LL.D., D.C.L. With Coloured Maps and other Illustrations.

Farrar's Life of Christ. *Cheap Illustrated Edition.* Large 4to, Cloth. (*See also 7s. 6d., Popular Edition, revised and enlarged. See also 10s. 6d., 21s., 24s., and 42s.*)

Farrar's Early Days of Christianity. *Popular Edition.* Cloth, gilt edges. Small 8vo, 6s.; 7s. 6d., 21s., 24s., and 42s.)

"Sunday": its Origin, History, and Present Obligation (Bampton Lectures, 1892). By the Ven. Archdeacon Hessey, D.C.L. *Fifth Edition.*

Child's Life of Christ, The. With about 400 Original Illustrations. 4to. (*Also at 10s. 6d., and Demy 4to Edition, 21s.*)

Child's Bible. *Cheap Edition.* Illustrated. Cloth. (*Also a superior edition at 10s. 6d.*)

8/-

Chums. The Illustrated Paper for Boys. Yearly Volume.

9/-

Practical Electricity. By Prof. W. E. Ayrton. Completely Rewritten. Illustrated.

The Queen's London. Containing nearly 400 Exquisite Views of London and its Environs. Cloth.

Battles of the Nineteenth Century. An entirely New and Original Work. With Several Hundred Illustrations. Complete in Two Vols. Each.

The Story of the Sea. Edited by Q. With New and Original Illustrations. Complete in Two Vols. Each.

Franco-German War, Cassell's History of the. Complete in Two Volumes. Containing about 500 Illustrations. Each.

Old and New Paris. A Narrative of its History, its People, and its Places. By H. Sutherland Edwards. Profusely Illustrated. In Two Vols. Each. (*Also in 250 full-page Illustrations.*)

Conquests of the Cross. Edited by Edwin Hodder. Illustrated. Complete in Three Vols. Each.

Adventure, The World of. Complete in Three Vols. Fully Illustrated. Each.

Queen Victoria, The Life and Times of. Complete in Two Vols. Illustrated. Each.

Our Earth and its Story. By Dr. Robert Brown, F.L.S. Complete in 2 Vols. With Coloured Plates and numerous Wood Engravings. Each.

Gleanings from Popular Authors. Complete in Two Vols., With Original Illustrations by the best artists. Each. (*Also in One Vol., 18s.*)

Universal History, Cassell's Illustrated. Vol. I., Early and Greek History. Vol. II., The Roman Period. Vol. III., The Middle Ages. Vol. IV., Modern History. With Illustrations.

Protestantism, The History of. By the Rev. J. A. Wylie, LL.D. Three Vols. With 600 Illustrations. Each. (*See also 30s.*)

United States, History of the (Cassell's). Complete in Three Vols. About 600 Illustrations. (*Library Edition, 30s.*)

British Battles on Land and Sea. In Four Vols. With about 600 Engravings. Each. *See page 8.*

Russo-Turkish War, Cassell's History of the. With about 500 Illustrations. Two Vols. Each.

London, Old and New. Complete in Six Vols. Containing about 1,200 Illustrations. Each.

Edinburgh, Cassell's Old and New. Complete in Three Vols. With 600 Original Illustrations. Each. *See also 25s. and 30s.*

London, Greater. Complete in Two Vols. By Edward Walford. With about 400 Original Illustrations. Each. *See also 30s.*)

Science for All. *Revised Edition.* Complete in Five Vols. Each containing about 350 Illustrations and Diagrams. Each.

10/6

A Diary of the Home Rule Parliament, 1892–95. By H. W. Lucy.

The Dictionary of English History. Edited by Sidney J. Low, B.A., and Prof. F. S. Pulling, M.A. Illustrated.

Moses and Geology; or, The Harmony of the Bible with Science. By the Rev. Samuel Kinns, Ph.D., F.R.S. With 20 Illustrations. (*Also Edition de Luxe, on larger and superior paper.*

Europe, A History of Modern. By C. A. Fyffe, M.A., late Fellow of University College, Oxford. *Cheap Edition.* In One Vol. (*Also Library Edition,* Illustrated, 3 Vols., 7s. 6d. each.)

A Vision of Saints. By Sir Lewis Morris (Fidelius). With 20 Full-page Illustrations. Also a 100-Illustrated Edition, 6s.

Old Dorset, Chapters in the History of the County. By H. J. Moule, M.A.

The Doré Don Quixote. With about 400 Illustrations by Gustave Doré. *Cheap Edition.*

Dictionary of Religion, The. By the Rev. William Benham, B.D. *Cheap Edition.* Cloth.

Farrar's Life of Christ. *Cheap Illustrated Edition.* (*See also 7s. 6d. Popular Edition.* Persian morocco. (*See also 7s. 6d., 21s., 24s. and 42s.*)

Fulton's Book of Pigeons With Standard for Judging. Tilted by Lewis Wright. Revised, Enlarged, and Supplemented by the Rev. W. F. Lansley. With Fifty Full-page Illustrations. *Popular Edition.* In One Vol. (*Also Original Edition,* with 50 Coloured Plates and Numerous Engravings, 21s.)

Electric Current, The. By Professor Walmsley. Illustrated.